S/N 2805006

8040A

Digital Multimeter

Maintenance Manual

FLUKE®

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_07973

FLUKE®

Instruction Manual

NOTE

This manual documents Model 8040A and its assemblies at the revision levels shown in Appendix 7A. If your instrument contains assemblies with different revision letters, it will be necessary for you to either update or backdate this manual. Refer to the supplemental change/errata sheet for newer assemblies, or to the backdating sheet in Appendix 7A for older assemblies.

Model

8040A

Digital Multimeter

P/N 427138

REV 1 6/79

October 1976

WARRANTY

Notwithstanding any provision of any agreement the following warranty is exclusive:

The JOHN FLUKE MFG. CO., INC., warrants each instrument it manufactures to be free from defects in material and workmanship under normal use and service for the period of 1-year from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, disposable batteries (rechargeable type batteries are warranted for 90-days), or any product or parts which have been subject to misuse, neglect, accident, or abnormal conditions of operations.

In the event of failure of a product covered by this warranty, John Fluke Mfg. Co., Inc., will repair and calibrate an instrument returned to an authorized Service Facility within 1 year of the original purchase; provided the warrantor's examination discloses to its satisfaction that the product was defective. The warrantor may, at its option, replace the product in lieu of repair. With regard to any instrument returned within 1 year of the original purchase, said repairs or replacement will be made without charge. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operations, repairs will be billed at a nominal cost. In such case, an estimate will be submitted before work is started, if requested.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS, OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. JOHN FLUKE MFG. CO., INC., SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE.

If any failure occurs, the following steps should be taken:

1. Notify the JOHN FLUKE MFG. CO., INC., or nearest Service facility, giving full details of the difficulty, and include the model number, type number, and serial number. On receipt of this information, service data, or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the instrument, transportation prepaid. Repairs will be made at the Service Facility and the instrument returned, transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of JOHN FLUKE MFG. CO., INC., instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Fluke Technical Center.) Final claim and negotiations with the carrier must be completed by the customer.

The JOHN FLUKE MFG. CO., INC, will be happy to answer all applications or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to: JOHN FLUKE MFG. CO., INC., P.O. BOX 43210, MOUNTLAKE TERRACE, WASHINGTON 98043, ATTN: Sales Dept. For European Customers: Fluke (Holland) B.V., P.O. Box 5053, 5004 EB, Tilburg, The Netherlands.

*For European customers, Air Freight prepaid.

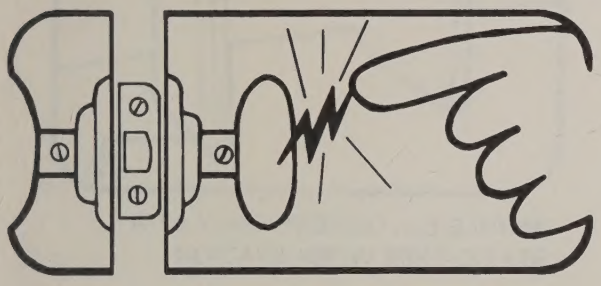
John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, Washington 98043

Rev. 4/80

static awareness

A Message From

John Fluke Mfg. Co., Inc.

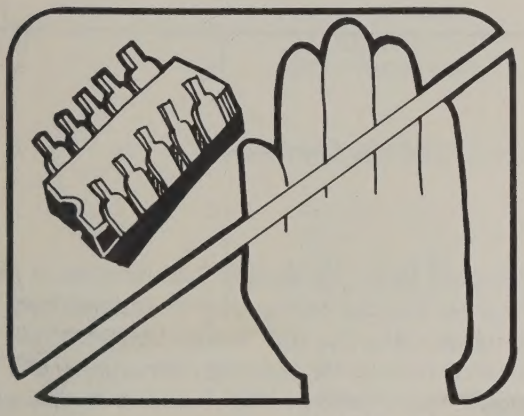


Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

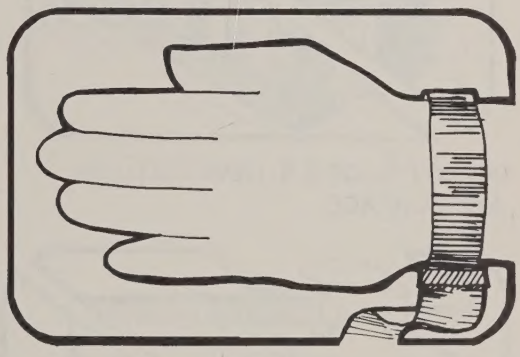
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol "⊗".

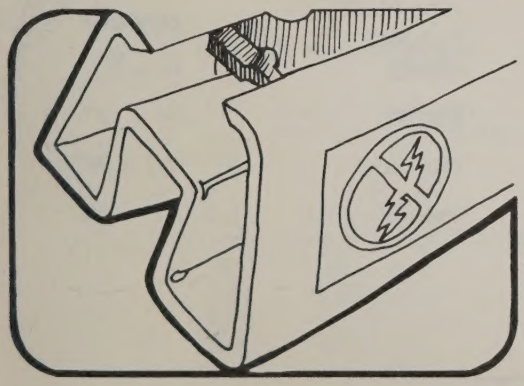
The following practices should be followed to minimize damage to S.S. devices.



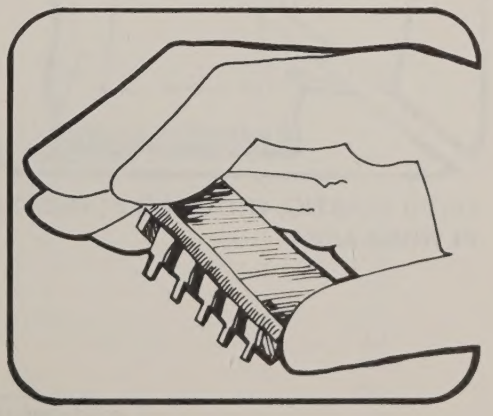
1. MINIMIZE HANDLING



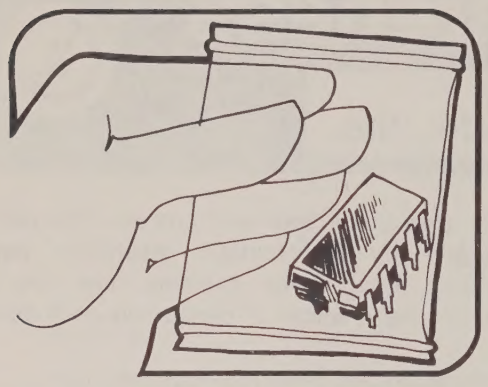
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES



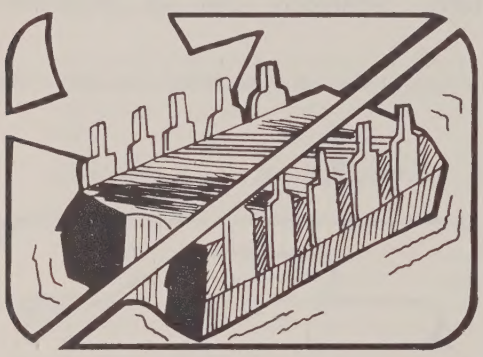
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



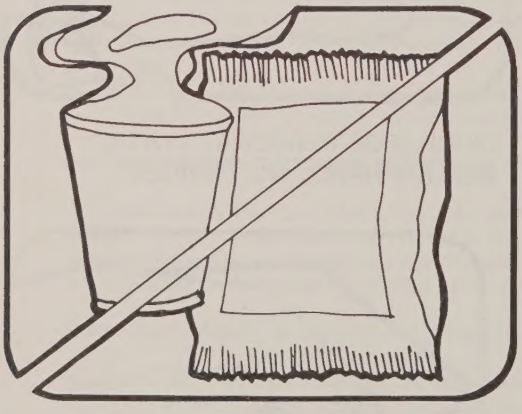
4. HANDLE S.S. DEVICES BY THE BODY



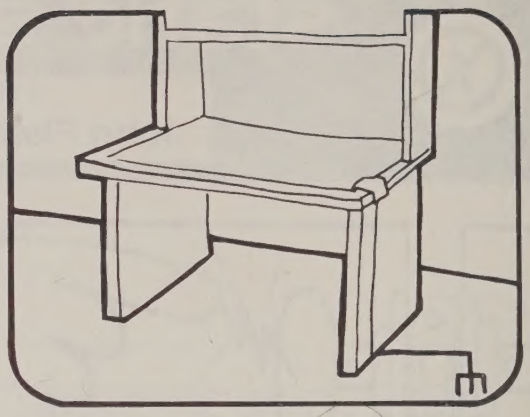
5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYROFOAM® IN WORK AREA



8. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION

9. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.

10. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc.. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Bag Size
453522	6" x 8"
453530	8" x 12"
453548	16" x 24"
454025	12" x 15"

PORTIONS REPRINTED
WITH PERMISSION FROM TEKTRONIX, INC.
AND GENERAL DYNAMICS, POMONA DIV.

® Dow Chemical

J0089A-07U7906 Litho in U.S.A.

Table of Contents

SECTION	TITLE	PAGE
1	**INTRODUCTION AND SPECIFICATIONS**	1-1
1-1.	INTRODUCTION	1-1
1-4.	ACCESSORIES	1-1
1-7.	SPECIFICATIONS	1-1
2	**OPERATING INSTRUCTIONS**	2-1
2-1.	INTRODUCTION	2-1
2-3.	SHIPPING INFORMATION	2-1
2-6.	INPUT POWER	2-1
2-8.	OPERATING FEATURES	2-1
2-10.	OPERATING NOTES	2-1
2-12.	Fuse Replacement	2-1
2-14.	Overrange Indication	2-1
2-16.	Input Overload Protection	2-3
2-18.	ASSEMBLY AND INITIAL OPERATION	2-3
2-22.	FUNCTION SELECTION EXAMPLES	2-5
3	**THEORY OF OPERATION**	3-1
3-1.	INTRODUCTION	3-1
3-3.	OVERALL FUNCTIONAL DESCRIPTION	3-1
3-4.	Introduction	3-1
3-6.	Analog Circuits	3-2
3-8.	Digital Circuits	3-2
3-10.	CIRCUIT DESCRIPTION	3-2
3-11.	Introduction	3-2
3-13.	Input Divider	3-2
3-15.	Current Shunts	3-2
3-17.	Buffer	3-2
3-19.	A/D Reference	3-2
3-26.	Ohms Voltage Source	3-3
3-28.	RMS Converter	3-5
3-33.	A/D Converter	3-5
3-35.	Timing and Control	3-5
3-38.	Display	3-6

(continued on page ii)

TABLE OF CONTENTS, *continued*

SECTION		TITLE	PAGE
4		**MAINTENANCE**	**4-1**
	4-1.	INTRODUCTION	4-1
	4-4.	SERVICE INFORMATION	4-2
	4-8.	GENERAL MAINTENANCE	4-2
	4-9.	Access Information	4-2
	4-11.	Cleaning	4-2
	4-13.	Fuse Replacement	4-3
	4-15.	Required Method for Voltage Source Connection	4-3
	4-17.	mA Terminal Input Connections	4-3
	4-19.	PERFORMANCE CHECK	4-3
	4-21.	DC Volts	4-3
	4-23.	AC Volts	4-4
	4-25.	Resistance Measurements	4-4
	4-27.	Direct Current	4-4
	4-29.	Alternating Current	4-4
	4-32.	CALIBRATION	4-5
	4-35.	Initial Check Procedure	4-5
	4-37.	DC Voltage Calibration	4-7
	4-39.	Ohms Calibration	4-7
	4-41.	VAC Midband Calibration	4-8
	4-43.	VAC Frequency Response Calibration	4-11
	4-45.	Current Calibration	4-11
	4-47.	Final Calibration Adjustment	4-12
	4-49.	CALIBRATION VERIFICATION	4-12
	4-51.	SELECT RESISTOR DETERMINATION	4-12
	4-53.	Select Resistor R32	4-12
	4-55.	Select Resistor R109	4-12
	4-57.	TROUBLESHOOTING	4-13
5		**LIST OF REPLACEABLE PARTS**	**5-1**
		TABLE OF CONTENTS	5-1
	5-1.	INTRODUCTION	5-2
	5-4.	HOW TO OBTAIN PARTS	5-2
6		**OPTIONS AND ACCESSORY INFORMATION**	**6-1**
		TABLE OF CONTENTS	6-1
	6-1.	INTRODUCTION	6-2
7		**GENERAL INFORMATION**	**7-1**
7A		**MANUAL CHANGE INFORMATION**	**7A-1**
8		**SCHEMATIC DIAGRAMS**	**8-1**
		TABLE OF CONTENTS	8-1

List of Tables

TABLE	TITLE	PAGE
1-1.	Accessories	1-1
1-2.	Specifications	1-2
2-1.	Controls, Indicators, and Connectors Descriptions	2-3
2-2.	8040A Maximum Allowable Input Overload Conditions	2-4
3-1.	Buffer Gain Configuration, kΩ Function	3-3
4-1.	Recommended Test Equipment	4-1
4-2.	DC Voltage Performance Check	4-4
4-3.	AC Voltage Performance Check	4-4
4-4.	Resistance Performance Check	4-5
4-5.	Direct Current Performance Check	4-5
4-6.	Ohms Calibration	4-8
4-7.	VAC Midband Calibration	4-10
4-8.	DC Voltage Calibration	4-10
4-9.	VAC Calibration Check	4-11
4-10.	Direct Current Accuracy Check	4-11
4-11.	Select Resistor R32	4-12
4-12.	Select Resistor R109	4-13

List of Illustrations

FIGURE	TITLE	PAGE
2-1.	Control, Indicator and Connector Locations	2-2
2-2.	Function Selection Examples	2-5
3-1.	8040A Block Diagram	3-1
3-2.	Simplified Buffer Circuit	3-3
3-3.	Simplified A/D Reference Circuit	3-4
3-4.	RMS Converter Representation	3-6
3-5.	Simplified RMS Converter Circuit	3-6
3-6.	Dual Slope A/C Conversion Timing for VAC or VDC Inputs	3-7
4-1.	Required Method for Voltage Source Connection	4-3
4-2.	mA Connection	4-4
4-3.	Location of Test Points and Adjustments	4-6
4-4.	Analog Converter PCB Test Point Locations	4-7
4-5.	Required Voltage Source Connection: mA Terminal	4-9
4-6.	Waveform at U26 Pin 8 for In-Range and Overrange Inputs	4-14
4-7.	Waveforms at TP1, Q10, C22, and U14 for In-Range and Overrange Inputs	4-15
4-8.	Oscilloscope Connections for Troubleshooting	4-16

Section 1
Introduction & Specifications

1-1. INTRODUCTION

1-2. The Model 8040A Multimeter provides the accuracy and portability required in today's field service work. A slide-out sunshade protects the 4 1/2 digit LED display from glare when operating the 8040A in adverse lighting conditions. The small size and battery power add to the portability; yet the fold-away stand allows the instrument to be positioned at a convenient angle for bench top use.

1-3. The 8040A offers 20,000 count resolution in all five functions. The count provides measurement resolution to 0.01 ohms on the 200 ohm range and 10 microvolts on the 200 millivolt range. AC voltage and current measurements are made using true rms conversion techniques for improved accuracy in communications and industrial control applications.

1-4. ACCESSORIES

1-5. Several accessories are available for use with the 8040A to expand its capabilities. A list of these accessories is provided in Table 1-1, while more detail about each one is provided in Section 6.

1-6. Note that two of the accessories, the 80T-150 Temperature Probe and A81 Battery Charger/Eliminator, are configured at the factory for particular applications. Insure that the correct form of the model number is used when ordering either of these accessories.

1-7. SPECIFICATIONS

1-8. The specifications of the 8040A are listed in Table 1-2.

Table 1-1. Accessories

ACCESSORY	DESCRIPTION	ACCESSORY	DESCRIPTION
80I-600	Clamp-on Current Probe; 2 to 600 amps	8040A-7005K	A Rechargeable Ni-cad Battery Pack (batteries come secured in the battery cover)
80F-5	High Voltage Probe; 5 kV		
80F-15	High Voltage Probe; 15 kV	8040A-7007K	A Battery Cover intended for use with alkaline batteries (batteries not included)
80K-40	High Voltage Probe; 40 kV		
81RF	High Frequency Probe; 20 kHz to 100 MHz	A81-115	Battery Charger/Eliminator for 115V, 50 to 60 Hz line source
82RF	High Frequency Probe; 100 kHz to 500 MHz	A81-100	Battery Charger/Eliminator for 100V, 50 to 60 Hz line source
80T-150C	Temperature Probe; -50°C to +150°C		
80T-150F	Temperature Probe; -58°F to +302°F	A81-230-1	Battery Charger/Eliminator for 230V 50 to 60 Hz line source (U.S. type plug)
C88	Carrying Case		
A80	Deluxe Test Lead Kit	A81-230	Battery Charger/Eliminator for 230V, 50 to 60 Hz line source (European type plug)

Table 1-2.Specifications

DC VOLTAGE

Ranges (Autoranging or Manual): ±200 mV, ±2V, ±200V, ±1100V.
Accuracy (6 months, 18° to 28°C):
200 mV Range: ±(0.05% of reading +3 digits).
2V through 1100V Ranges: ±(0.05% of reading +2 digits).
Input Impedance: 10 MΩ, all ranges.
Normal Mode Noise Rejection: Greater than 60 dB at 50 Hz and 60 Hz.
Common Mode Noise Rejection: Greater than 120 dB at 50 Hz and 60 Hz (1 kΩ in either lead).
Maximum Input Voltage:
200 mV and 2V ranges:
500V dc or rms ac (continuous)
1100V dc or peak ac for less than 10 sec.
20V, 200V and 1100V ranges:
1100V dc or peak ac (continuous).

AC VOLTAGE (TRUE RMS)

Ranges (Autoranging or manual): 200 mV, 2V, 20V, 200V, 750V.
Accuracy (6 months, 18° to 28°C, from 5% of range to full range):
45 Hz to 10 kHz: ±(0.5% of reading +10 digits).
10 Hz to 20 kHz: ±(1.0% of reading +10 digits).
Input Impedance: 10 MΩ in parallel with less than 100 pF.
Common Mode Noise Rejection: Greater than 60 dB at 50 Hz and 60 Hz (1 kΩ in either lead).
Crest Factor: 3.0.
Maximum Input Voltage:
200 mV and 2V ranges:
500V rms or 700V peak ac (continuous).
750V rms, 1100V peak ac or 10^7 volt-hertz (whichever is less), for less than 10 sec.
20V, 200V and 750V ranges:
750V rms, 1100V peak ac or 10^7 volt-hertz (whichever is less), continuous.

DC mA

Ranges: ±200 μA, 2 mA, 20 mA, 200 mA, 2000 mA.
Accuracy (6 months, 18° to 28°C): ±(0.3% of reading +3 digits).
Burden Voltage: 0.25V dc max. except 0.7V dc max. on 2000 mA range.
Maximum Input: 2 amps (fuse protected).

AC CURRENT (TRUE RMS, AC + DC)

Ranges: 200 μA, 2 mA, 20 mA, 200 mA, 2000 mA.
Accuracy (6 months, 18° to 28°C, from 5% of range to full range):
200 μA, 2 mA, 20 mA and 200 mA ranges:
45 Hz to 20 kHz: ±(1.0% of reading +10 digits).
2000 mA range:
45 Hz to 3 kHz: ±(1.0% of reading +10 digits).

Voltage Burden: 0.25V rms max. except 0.7V max. on 2000 mA range.
Crest Factor: 3.0.
Maximum Input: 2 amps rms (fuse protected).

RESISTANCE

Ranges (Autoranging and manual): 200Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2000 kΩ, 20 MΩ.
Accuracy (6 months, 18° to 28°C): ±(0.2% of reading +3 digits) except 20 MΩ range. ±(0.5% of reading +3 digits).
Maximum Current Through Unknown: 0.5 mA on 200Ω range.
Open Circuit Voltage: 5 volts.
Maximum Input Voltage: All ranges, 250V ac or 100V dc.

GENERAL

Temperature Coefficient: <1/10 of applicable accuracy specification per °C (0°C to 18°C, 28°C to 50°C).
Maximum Common Mode Voltage: 500V dc or peak ac.
Line: 100/115/230V, 48-66 Hz, 1W (instrument only), 8W (charging) max.
Battery: Rechargeable Ni-cad pack (8 hour typical operation from full charge, typical recharge time 14 hours of ambient temperature <30°C to achieve full charge). Non-rechargeable 4 alkaline "C" cells provide 14 hour operation (typical).
Size: 6.4 cm high X 14.5 cm long X 12.4 cm wide. (2.5 in. H X 5.7 in. L X 4.9 in. W).
Weight: 1.0 kg (2.2 pounds).

ENVIRONMENTAL

Operating Temperature Range: 0°C to +50°C.
Storage Temperature Range: -40°C to +70°C (without batteries), -40°C to +50°C (with Ni-cad batteries).
Relative Humidity: 0-80% to +35°C; 0-70% to +50°C.

Section 2
Operating Instructions

2-1. INTRODUCTION

2-2. This section of the manual contains information regarding the correct operation of the Model 8040A Multimeter. It is recommended that the contents of this section be read and understood before attempting to operate the instrument. For additional application or operation literature write or call the John Fluke Mfg. Co., Inc.; P.O. Box 43210, Mountlake Terrace, WA 98043; telephone (206) 774-2211.

2-3. SHIPPING INFORMATION

2-4. The 8040A was packed and shipped in a foam container especially designed to provide adequate protection. Upon receipt, inspect the instrument for possible shipping damage. If anything is wrong, contact the place of purchase immediately. If satisfaction is not obtained, contact the nearest John Fluke Service Center. A list of these service centers is located at the rear of this manual.

2-5. If reshipment of the instrument is necessary, the original container should be used. If the original container is not available, a new one can be obtained from the John Fluke Mfg. Co., Inc. Please reference the instrument model number when requesting a new shipping container.

2-6. INPUT POWER

2-7. Operating power for the standard 8040A instrument comes from four, non-rechargeable, alkaline "C" size batteries. The power source typically provides 14 hours of instrument operation. Optional power sources available include rechargeable Ni-cad batteries and a battery charger/eliminator. The instrument equipped with rechargeable batteries will typically operate for 8 hours; recharging, using the charger/eliminator, takes approximately 14 hours with the instrument turned off.

2-8. OPERATING FEATURES

2-9. The location of the 8040A controls, indicators and connectors is shown in Figure 2-1. A description of the controls, indicators, and connectors is provided in Table 2-1.

2-10. OPERATING NOTES

2-11. The following paragraphs describe various conditions which should be considered before operating the 8040A.

2-12. Fuse Replacement

2-13. The 8040A is equipped with two fuses. F1 is a current overload fuse to protect the instrument circuitry from inadvertent applications of current in excess of 2 amps. This fuse is located behind the mA input jack and is removed by pressing in lightly on the jack then turning it counterclockwise 1/4 turn to release. When replacement is necessary, use a 2 amp AGX replacement fuse. F2 is a current overload fuse to protect the instrument from battery charging currents in excess of 3 amps. This fuse should be replaced only by qualified personnel. Replacement of both fuses is described in Section 4 for qualified personnel.

2-14. Overrange Indication

2-15. When the full-scale capability of the selected range for any function is exceeded, the display will blink. The overrange indication does not necessarily mean that the instrument is being exposed to a damaging input condition.

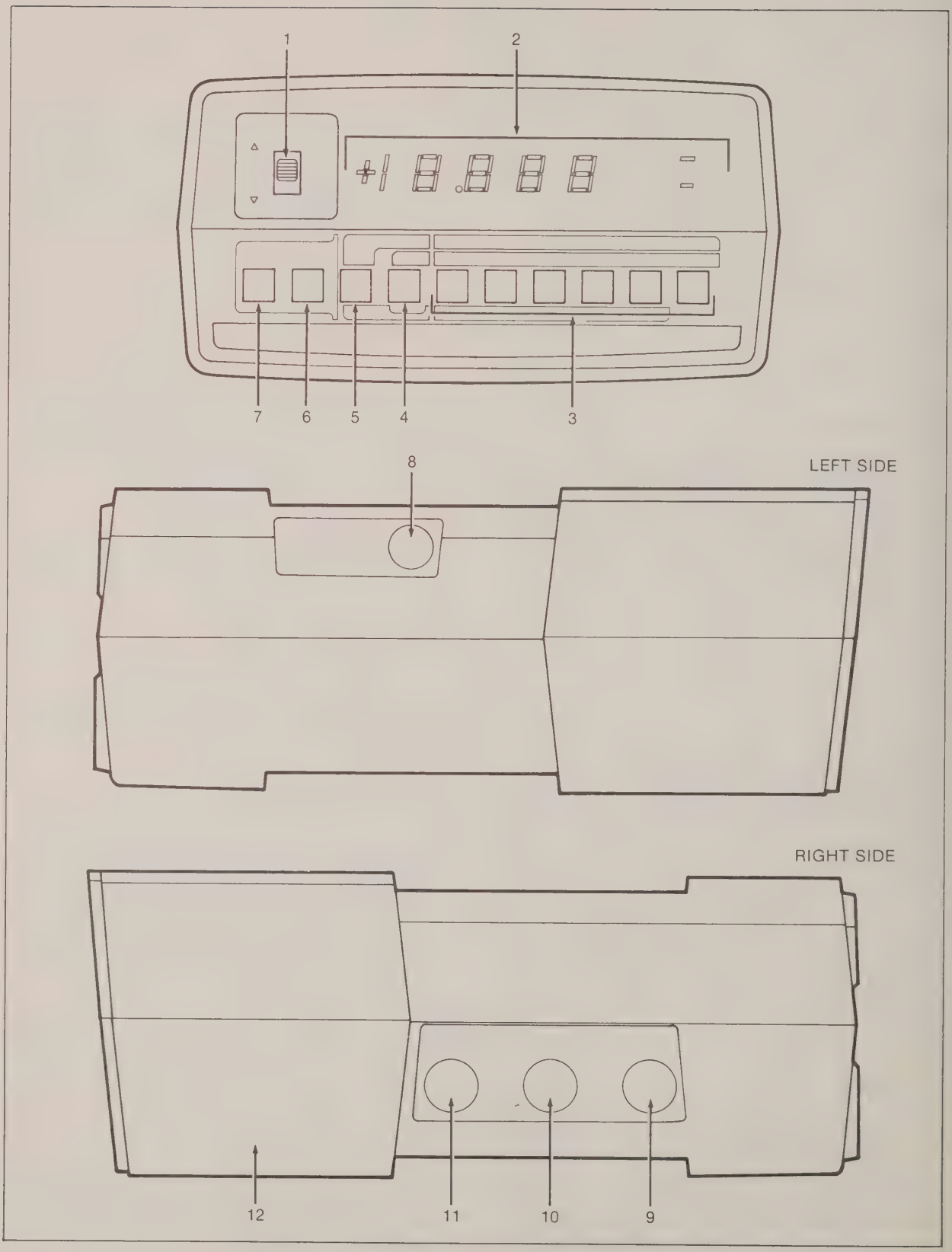


Figure 2-1. Control, Indicator, and Connector Locations

Table 2-1. Control, Indicator, and Connector Descriptions

ITEM NUMBER	NAME	DESCRIPTION
1	POWER Switch	Separates the power source (batteries or battery eliminator) from 8040A circuitry.
2	Display	A 4½ digit display (19999 maximum) of the measured input, including decimal point and polarity sign when appropriate. The units annunciators (MΩ or μA mV Ω) light when the applicable range is selected.
3	Range Switches	Provide pushbutton selection of one of five ranges for each function, i.e., DC Voltage: 200 mV, 2, 20, 200, 1100V, or AUTO. AC Voltage: 200 mV, 2, 20, 200, 750V rms, or AUTO. AC or DC Current: 200 μA, 2, 20, 200, or 2000 mA. Resistance: 200Ω, 2, 20, 200, 2000 kΩ, or 20 MΩ/AUTO.
4	kΩ	Selects resistance measurement mode of operation.
5	V mA	Works in conjunction with the DC and AC switches to select the voltage function (out position) or current function (in position).
6	AC	This switch, in conjunction with item 5, selects ac voltage or alternating current measurement capability.
7	DC	This switch, in conjunction with item 5, selects dc voltage or direct current measurement capability.
8	BATTERY CHARGER/ ELIMINATOR	Jack provided for connection of the charger/eliminator accessory.
9	V-Ω	Jack for high (red) lead connection to 8040A for voltage (ac or dc) and resistance measurements.
10	COMMON	Jack for low (black) lead connection to 8040A for all functions.
11	mA	Jack for high (red) lead connection to 8040A for current (ac and dc) measurements (2A FUSE behind; push in and twist ¼ turn and pull to remove).
12	Sunshade	Shade slides forward to improve the readability of the displays in bright light environments.

2-16. Input Overload Protection

CAUTION

Exceeding the maximum input overload conditions can damage the 8040A. Read Table 2-2 before attempting to operate the instrument.

2-17. The overload protection varies with the range and function selected. The maximum allowable input overload condition for each function and range is given in Table 2-2.

2-18. ASSEMBLY AND INITIAL OPERATION

2-19. It is recommended that the assembly and initial operation of the 8040A be done in accordance with the following procedure. No test equipment is required to perform this procedure; all signals observed are generated by the 8040A. This procedure may be used as an instrument operational evaluation when the 8040A is being used in locations away from normal calibration equipment.

2-20. Assemble the 8040A as follows:

1. Remove the contents of the box marked

BATTERY COVER. (Four "C" size batteries, a battery cover and two mounting screws for non-rechargeable batteries; an assembled pack and two mounting screws for rechargeable batteries.

CAUTION

Do not operate 8040A without battery cover in place (batteries do not have to be installed).

2. The four, non-rechargeable, alkaline batteries are to be mounted in the battery clips (position as indicated on 8040A case) then the battery cover secured in place with the two screws provided. When installing the battery pack, note the guide tab on the edge of the cover and match it with the recess in the bottom center of the 8040A case.

2-21. The following procedure may be used to check the basic operation of the 8040A. It is not intended to be used as a verification of calibration accuracy. Proceed with the operational check below:

1. Turn the 8040A on.

2. Connect the red test lead to the V-Ω input terminal.

3. To check the DC voltage operation:

   a. Select volts dc function (see Function Selection Examples) and the 20 range.

   b. Insert the test lead probe into the BTRY TEST hole, located on the bottom of the 8040A case.

   c. The 8040A display will indicate the battery voltage; between 4.0 volts and 5.8 volts.

4. To check the AC Volts operation:

   a. Select the volts ac function and 200 mV range.

   b. The 8040A display will indicate the ripple voltage created by the inverter. This voltage will be as much as 60 mV ac (battery operation) or 150 mV ac with the charger/eliminator as power source.

NOTE

Due to the charging of the input coupling capacitor, it will take 5 to 10 seconds for this reading to settle.

5. To check the Resistance operation:

   a. Select the resistance function and 2 range.

   b. Insert the test probe tip into the mA input terminal.

   c. The 8040A display will indicate 0.100 +2 digits.

Table 2-2. 8040A Maximum Allowable Input Overload Conditions

SELECTED FUNCTION	SELECTED RANGE	INPUT CONNECTIONS	MAXIMUM INPUT OVERLOAD LIMITS
VDC	200 mV, 2V	V-Ω and COMMON	500V dc or V rms (continuous) 1100V dc or peak ac (for less than 10 seconds)
	20, 200, 1100V	V-Ω and COMMON	1100V dc or peak ac
DC mA	200 μA, 2, 20, 200, or 2000 mA	mA and COMMON	2 amps, 250V Fuse Protected
VAC	200 mV, 2V	V-Ω and COMMON	500V dc or ac (continuous) 750V rms, 1100V peak, or 10^7 V-Hz, whichever is less, for less than 10 seconds
	20, 200, 750V	V-Ω and COMMON	750V rms, 1100V peak, or 10^7 V-Hz, whichever is less (continuous)
AC mA	200 μA, 2, 20, 200 2000 mA	mA and COMMON	2 amp, 250V Fuse Protected
kΩ	200Ω, 2, 20, 200, 2000 kΩ, or 20 MΩ	V-Ω and COMMON	250V ac or 100V dc

6. To check the DC mA operation:

   a. Connect the red test lead to the mA input terminal.

   b. Select the dc mA function and 2 range.

   c. Place the test probe tip into the BTRY TEST hole.

   d. The 8040A display will indicate between 0.400 and 0.580 mA. (The current depends upon the battery voltage measured in step 3-b and 3-c.)

7. To check the AC mA operation:

   a. Select the AC mA function.

   b. The 8040A display will indicate the same as step 6-d (mA input is dc coupled).

2-22. FUNCTION SELECTION EXAMPLES

2-23. Figure 2-2 provides a graphic illustration of switch positions and input connections for each 8040A function.

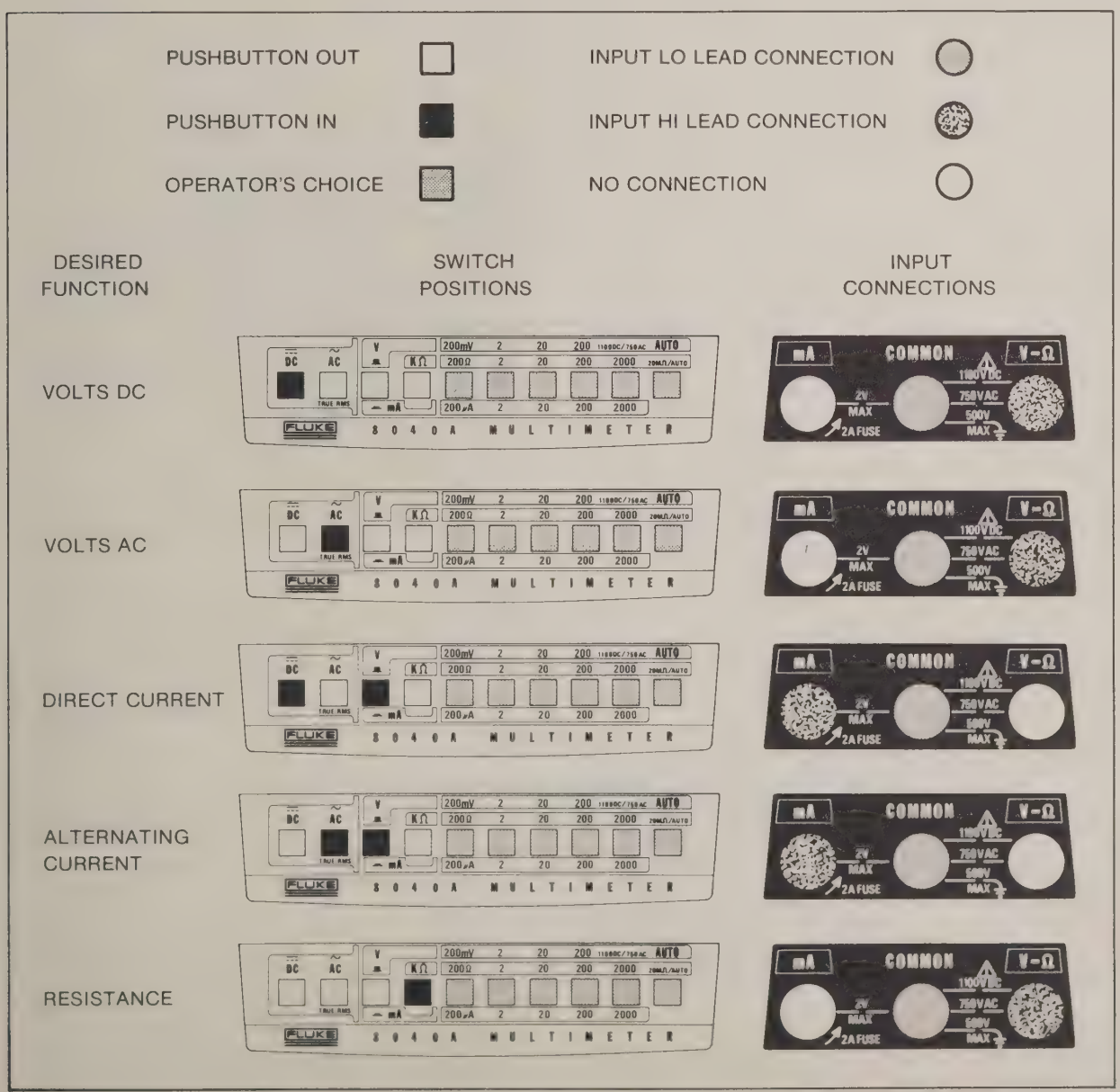


Figure 2-2. Function Selection Examples

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. The theory of operation for the Model 8040A is arranged under two major headings. The first, titled OVERALL FUNCTIONAL DESCRIPTION, discusses the overall operation of the instrument in terms of the functional relationships of the major circuits. The second section is titled CIRCUIT DESCRIPTION and deals with the internal operation of each major circuit in more detail. Block diagrams and simplified circuit diagrams are included where needed, to aid in understanding the theory. The complete schematic diagrams are located in Section 8.

3-3. OVERALL FUNCTIONAL DESCRIPTION

3-4. Introduction

3-5. The 8040A circuitry can be divided into two major sections; an Analog section and a Digital section. The interconnection of the two major sections of circuitry, including the subsections within each section, is illustrated in Figure 3-1. This section of theory will discuss the operation of the 8040A in terms of the two major sections (and subsections of each) giving a brief look at the function and interrelationship of these circuits.

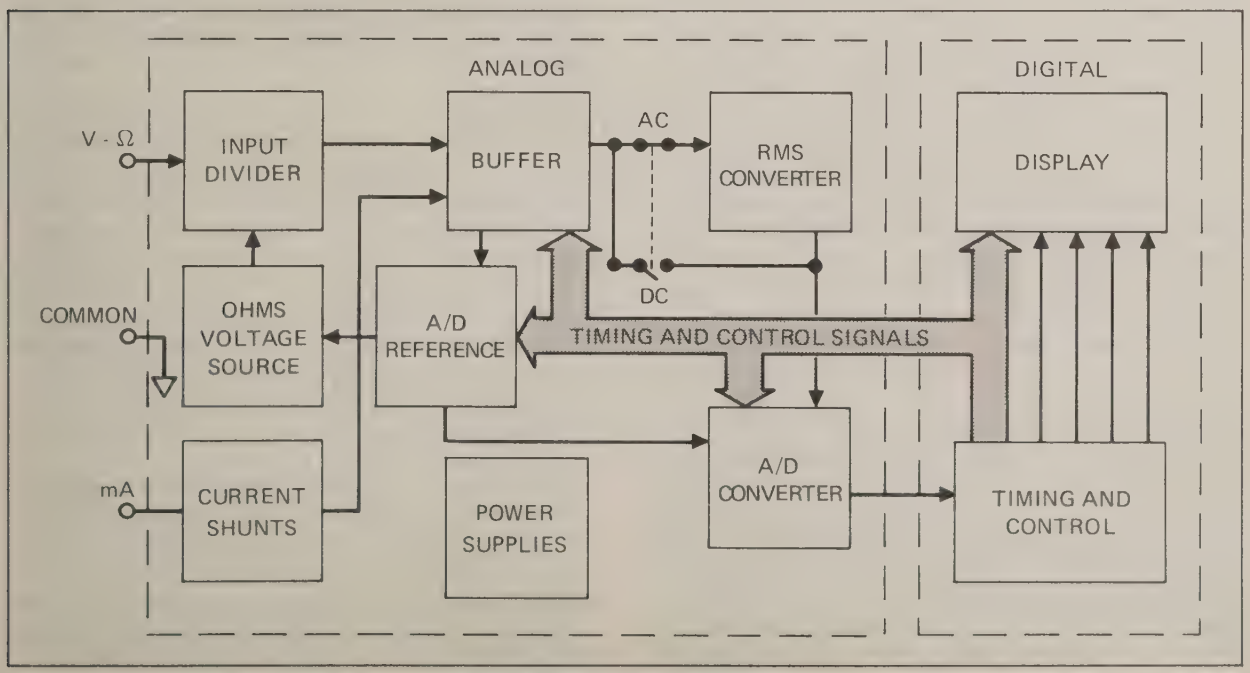


Figure 3-1. 8040A Block Diagram

3-6. Analog Circuits

3-7. The Analog portion of the 8040A circuitry consists of an Input Divider, Buffer, RMS Converter, Ohms Voltage Source, A/D Reference, Current Shunts, Power Supplies and A/D Converter. The inputs to be measured are connected to the Analog circuitry via the V-Ω or mA terminals. A DC voltage, directly proportional to the applied input, is developed by the RMS Converter and applied to the A/D Converter. This dc voltage equivalent of the applied input charges a capacitor in the A/D to a level proportional to the input. A reference voltage, opposite in polarity to the voltage representing the applied input, is then connected to the A/D causing the charged capacitor to discharge at a constant rate. The time it takes the capacitor to discharge is therefore proportional to the applied input. The Digital section of the 8040A circuitry measures the time and displays it as a digit representation of the input signal.

3-8. Digital Circuits

3-9. The Digital section consists of Timing and Control and Display circuits. The Timing and Control signals connect the dc voltage representing the input being measured to the A/D for 100 ms then disconnect it and apply the reference voltage. At the time the reference voltage is applied, the Timing and Control circuit starts counting the number of cycles of the Crystal Oscillator that occur until the A/D sends a signal to the Timing and Control circuit indicating that the capacitor has been discharged to zero. The number of cycles of oscillator signal that occurred is presented on the display as the value of the unknown input being measured by the 8040A.

3-10. CIRCUIT DESCRIPTION

3-11. Introduction

3-12. This section of 8040A theory of operation will look at the subsections of circuitry, as presented in the block diagram, in more detail. When needed for explanation, simplified schematic diagrams of the circuits being discussed will be provided.

3-13. Input Divider

3-14. The Input Divider performs two basic functions when measuring unknown inputs applied to the V-Ω terminal. First, when measuring either dc or ac voltages, the divider is used to scale the input voltages down to a level that can be handled by the Buffer. The second function of the divider is to provide resistors which can be connected in series with the unknown resistance applied to the V-Ω terminal to form a voltage divider. The Ohms Source Voltage is applied to this voltage divider and the voltage drop across the unknown resistance is measured by the 8040A to calculate the value of the resistance.

3-15. Current Shunts

3-16. The Current Shunts are a set of series connected resistors. The unknown current applied to the mA terminal develops a voltage proportional to the current across the portion of the shunt resistors selected by the range switch. The 8040A processes the voltage developed across the shunt resistor and displays the value of the input current.

3-17. Buffer

3-18. The output voltage of either the Input Divider (measurement of dc or ac volts), the V-Ω terminal (measurement of resistance) or the Current Shunts (measurement of dc or ac mA) is applied to Q8 in the Buffer (see Figure 3-2). The gain of the buffer is changed to compensate for the changes in the output voltage of the Input Divider and Current Shunts. A combination of buffer gain (X1 or X10) and scale factor of the Input Divider or Current Shunts is selected so that the output of the Buffer will not exceed 2V dc (or rms) for any full-scale input in either the dc (or ac) voltage or current function. Because of changes in the reference voltage used in the resistance function (explained in the A/D Reference theory) the output of the Buffer, for full-scale inputs, changes when the range changes. Table 3-1 provides the gain and buffer output information for each range.

3-19. A/D Reference

3-20. After the output of the Buffer has been applied to the A/D Converter for 100 ms the Timing and Control signals disconnect the Buffer output and connect the appropriate A/D Reference voltage. Figure 3-3 is a simplified schematic diagram of the A/D Reference circuit.

3-21. When the 8040A is used to measure dc volts or current, the Timing and Control circuit detects the polarity of the voltage applied to the A/D Converter and selects the reference voltage of the opposite polarity. If, for example, the input to the 8040A is positive the Control circuits would produce a DE (–R) command which would cause the –Vref gate (part of U8) to turn on and supply a –1.0 volt reference to the A/D Converter. A negative polarity input to the 8040A will cause the Control circuit to provide a DE (+R) command to turn on the +Vref gate to apply a +1.0 volt reference to the A/D Converter.

3-22. AC voltage or current applied to the 8040A is processed by the RMS Converter so that the dc voltage (proportional to the ac input voltage) applied to the A/D Converter is always positive polarity. In the AC function (volts or current) the Control circuit produces a DE (–R) command to apply the –Vref to the A/D Converter. In the AC and DC functions reference voltage is fixed at 1.0 volt, either positive or negative.

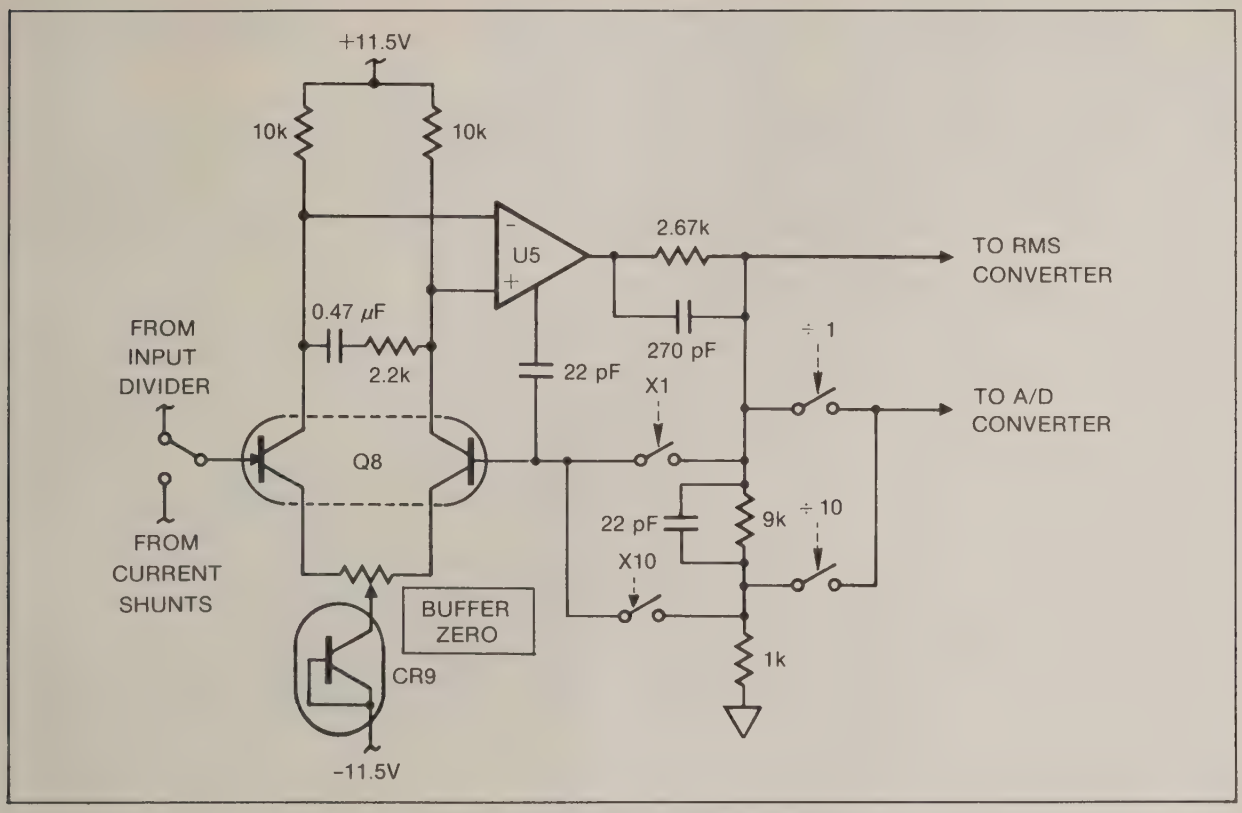


Figure 3-2. Simplified Buffer Circuit

Table 3-1. Buffer Gain Configuration, kΩ Function

RANGE	BUFFER GAIN AND DIVISION	FULL-SCALE BUFFER OUTPUT
200	X10, ÷1	980 mV
2 kΩ	X10, ÷1	980 mV
20 kΩ	X1, ÷1	833 mV
200 kΩ	X10, ÷1	980 mV
2000 kΩ	X1, ÷1	833 mV
20 MΩ	X1, ÷10	333 mV

3-23. In the resistance (kΩ) function the reference voltage changes as the input to the 8040A changes. The 8040A uses a ratio ohms conversion technique to determine the value of the unknown resistance applied to the input terminals. This technique works on the principle that when a voltage (Ohms Source Voltage) is applied across series connected resistors (the Input Divider resistors and the unknown) the voltage drop across each will be proportional to the value of each resistor.

3-24. The 8040A calulates the value of the unknown resistor. The formula follows to make this calculation:

$$Rx = Rref \times Vx/Vref$$

Where Rx is the unknown resistance, Rref is the Input Divider resistor(s) selected by the range relays, Vx is the voltage across the unknown resistance and Vref is the voltage across the Input Divider resistor(s).

3-25. Since the value of the reference resistor(s) in the Input Divider is fixed for any given range and the resistance values are a factor of 10 apart, the position of the decimal point in the display makes the adjustment for the Rref term in the formula. The 8040A directly reads the value of Vx and applies the resulting Buffer output to the A/D Converter for 100 ms. The value of Vref is determined by algebraically adding Vx (a positive voltage) to a negative equivalent of the Ohms Source Voltage. The resulting voltage is Vref and is applied to the A/D Converter at the end of the 100 ms application of Vx.

3-26. Ohms Voltage Source

3-27. The ohms source voltage is derived from the positive voltage source in the A/D reference. Operational Amplifier U1 and associated components (see schematics in Section 8) make up the unity gain buffer amplifier that supplies the ohms source voltage. The Ohms Voltage Source circuit is used exclusively in the resistance measurement function.

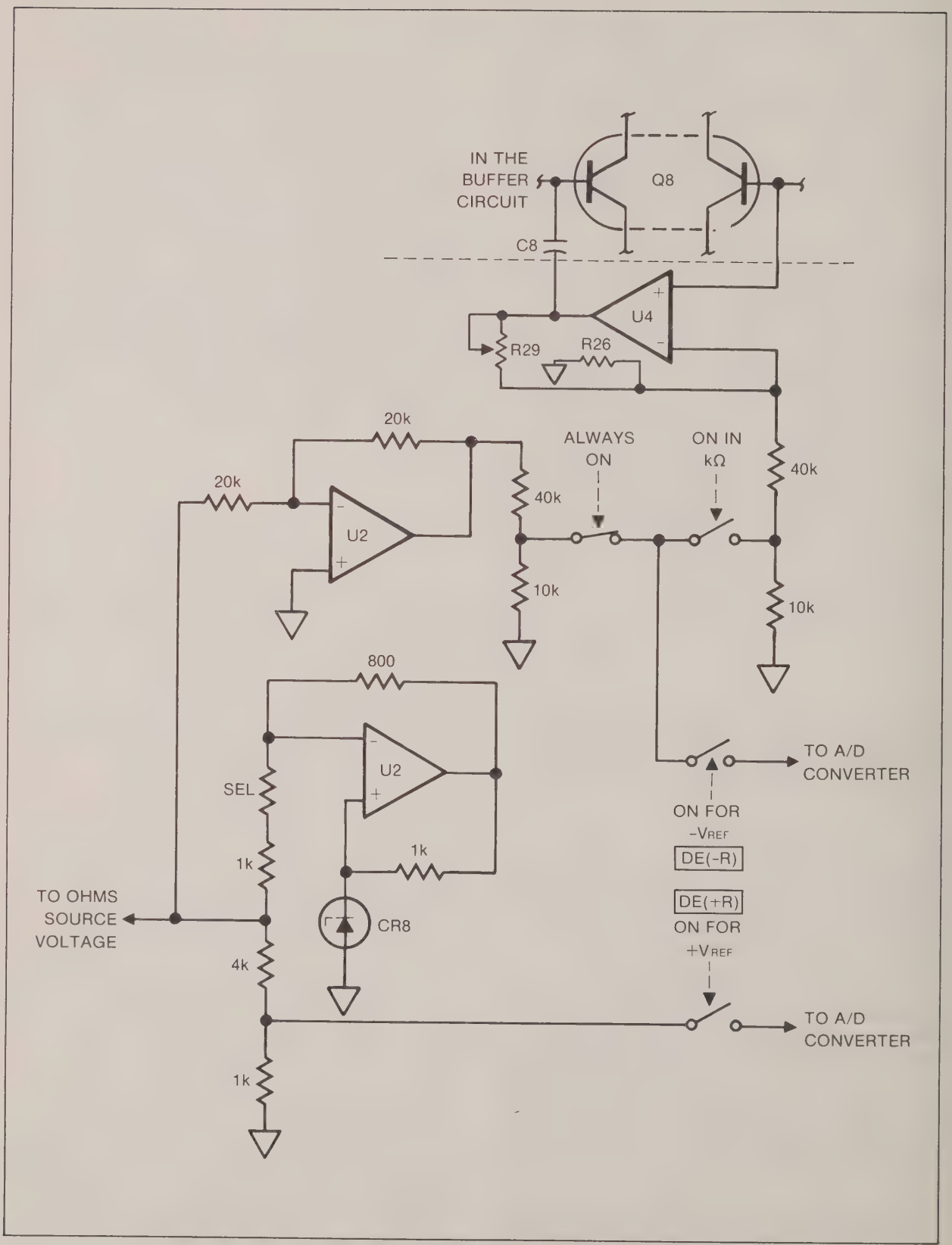


Figure 3-3. Simplified A/D Reference Circuit

3-28. RMS Converter

3-29. An rms amplitude is that value of alternating current or voltage that results in the same power dissipation in a given resistance as dc current or voltage of the same numerical value. The mathematical formula for determining the rms value of an ac voltage is:

$$Vrms = \sqrt{\overline{Vi^2}}$$

Where Vi is the value of the ac voltage at any given instant. The 8040A RMS Converter monitors the instantaneous voltage and computes the rms value of the input signal.

3-30. The 8040A uses an implicit method for computing the rms value of the input. Figure 3-4 is a block diagram of the implicit method of calculating the rms value of an ac voltage. The output voltage of the RMS Converter (Vo) is a dc voltage proportional to the rms value of the ac voltage applied to the 8040A. This is proven by the following mathematical calculations. As indicated in Figure 3-4, $Vo = (\overline{Vi^2})/Vo$; therefore, by multiplying both sides of the equation by Vo we get $Vo^2 = \overline{Vi^2}$. By taking the square root of both sides the formula becomes $Vo = \sqrt{\overline{Vi^2}}$.

3-31. In the 8040A implicit conversion method the Multiplier-Divider function is performed using a Log-Antilog circuit. The base-emitter voltage of a transistor is almost perfectly logarithmically related to the collector current. By putting two transistors in series we obtain two times the log of the input; then by taking the antilog we obtain a voltage proportional to the square of the input (Vi^2).

3-32. The components in the 8040A RMS Converter that perform the various functions in calculating the rms value of the input are illustrated in Figure 3-5. The input signal (Vi) to the RMS Converter is first applied to a circuit which produces a current representative of the absolute value of the input. The current is then applied to the collector of the first of the two series connected transistors that, in conjunction with Operational Amplifier U38, produce a voltage output representing two times the log of Vi. A feedback circuit through U13 (pins 1, 2, and 3) and the upper right transistor in array U11 provide a voltage equal to the log of Vo. Subtracting the log of Vo from two times the log of Vi is equal to the mathematical function of calculating Vi^2/Vo. The final step in determining the rms value is handled by U13 (pins 7, 6 and 5), the lower right transistor of array U11 and the output filter (the 47k resistor and 0.47 μF capacitor). These components calculate the antilog of $\overline{Vi^2}/Vo$ producing an output voltage equal to $\sqrt{\overline{Vi^2}}$, this voltage being directly proportional to the rms value of the input applied to the 8040A.

NOTE

Since the 8040A is a true rms responding instrument the display will indicate a reading (typically less than 90 digits) when the input is shorted in the ACV or ACI functions. The accuracy of the 8040A is not significantly affected by this internal offset when measuring inputs that are in the specified portion of the selection range (5% to 100% of range). When the rms value of the two values (internal offset and 5% of range) is calculated, the effect is shown to be minimal.

$$rms = \sqrt{90^2 + 1000^2} = 1004$$

3-33. A/D Converter

3-34. The A/D Converter receives the dc voltage output, from either the RMS Converter or Buffer, representing the unknown value applied to the 8040A input terminal Timing signals from the Timing and Control circuit cause the RMS Converter or Buffer output voltage to be applied to the A/D for exactly 100 ms. The amplitude of this input voltage controls the rate at which a capacitor in the A/D is charged, so that at the end of the 100 ms integrate period the charge on the capacitor is proportional to the unknown applied to the 8040A. At the end of the 100 ms integrate period the input to the A/D is then connected to the A/D Reference The reference voltage is selected, by the Timing and Control circuit, to be opposite in polarity from the output of the Buffer or RMS Converter. The reference voltage causes the capacitor in the A/D Converter to discharge at a constant rate. The time, called, read period, that it takes the capacitor to discharge is directly proportional to the unknown input applied to the 8040A. Figure 3-6 illustrates the charge-discharge cycle of the A/D capacitor for ac or dc volts or current inputs. The charge-discharge cycle of the A/D capacitor in the kΩ function is unique because the reference voltage is inversely related to the unknown resistance value. This causes the discharge rate (slope) during the read period to change with the input.

3-35. Timing and Control

3-36. The Timing and Control circuit, in conjunction with the A/D Converter output, change what has been an analog representation of the unknown input into a digital representation. Signals from the Timing and Control circuit select the Buffer gain and the signal path for processing the unknown input. Correct timing of these signals is derived from a 1 MHz crystal controlled oscillator.

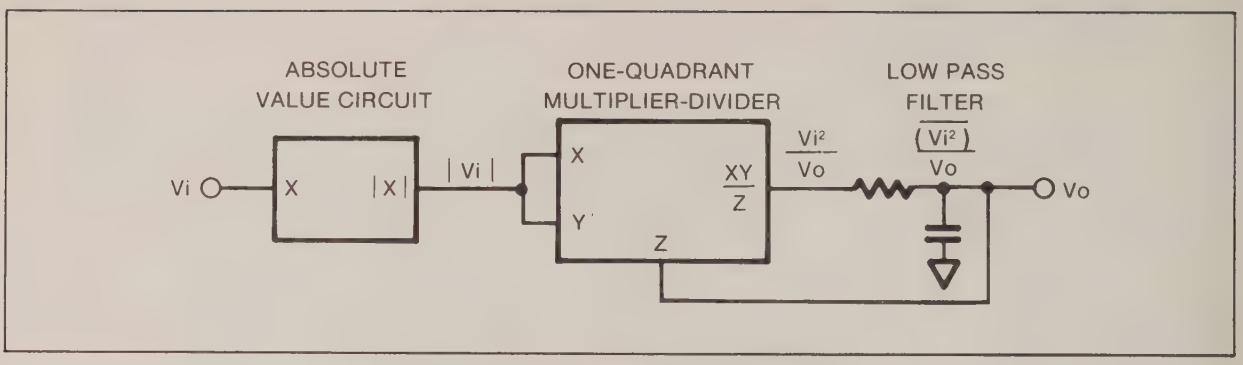


Figure 3-4. RMS Converter Representation

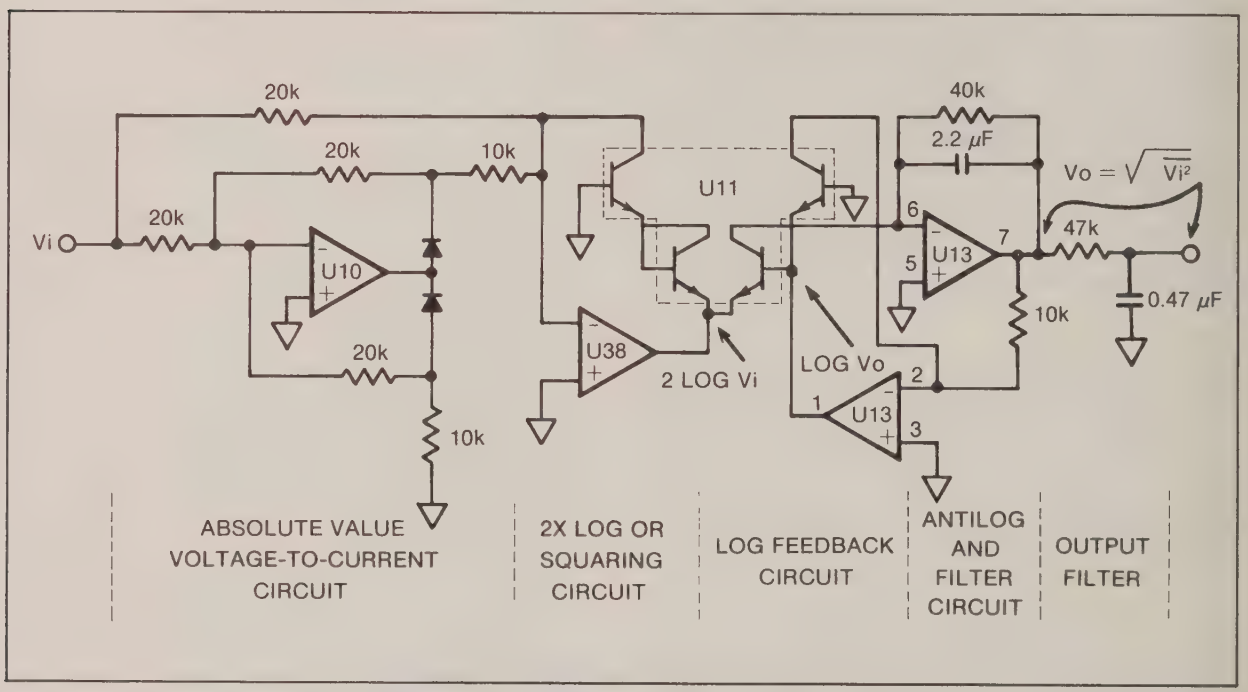


Figure 3-5. Simplified RMS Converter Circuit

3-37. All of the digitizing process (the actual counting of the oscillator pulses during the read period) takes place in the custom integrated circuit U25. The pulses accumulate, during the read period, in decade counters within the custom chip. The number in each decade counter is converted to a four-bit binary code. Strobe signals, generated by the custom chip, then cause the binary code for one decade counter at a time to be sent to the Display circuitry where the same strobe signal causes one of the LEDs of the display to be strobed on to display that number.

3-38. Display

3-39. The custom chip provides strobe signals (ST0 through ST7) some of which are used by the Display circuits to turn on the LEDs one at a time. The four-bit binary coded digit information applied to the display is first changed by U27 (see schematic in Section 8), from the binary code to seven driver signals; one for each segment in the LEDs. The seven segment drive signals are connected in parallel to each of the display digits. The strobe signals allow only one display LED to light at a time. The strobe signal causes the digit in the display corresponding to the digit with the same significant value transmitted from the Timing and Control circuit to appear in the correct position.

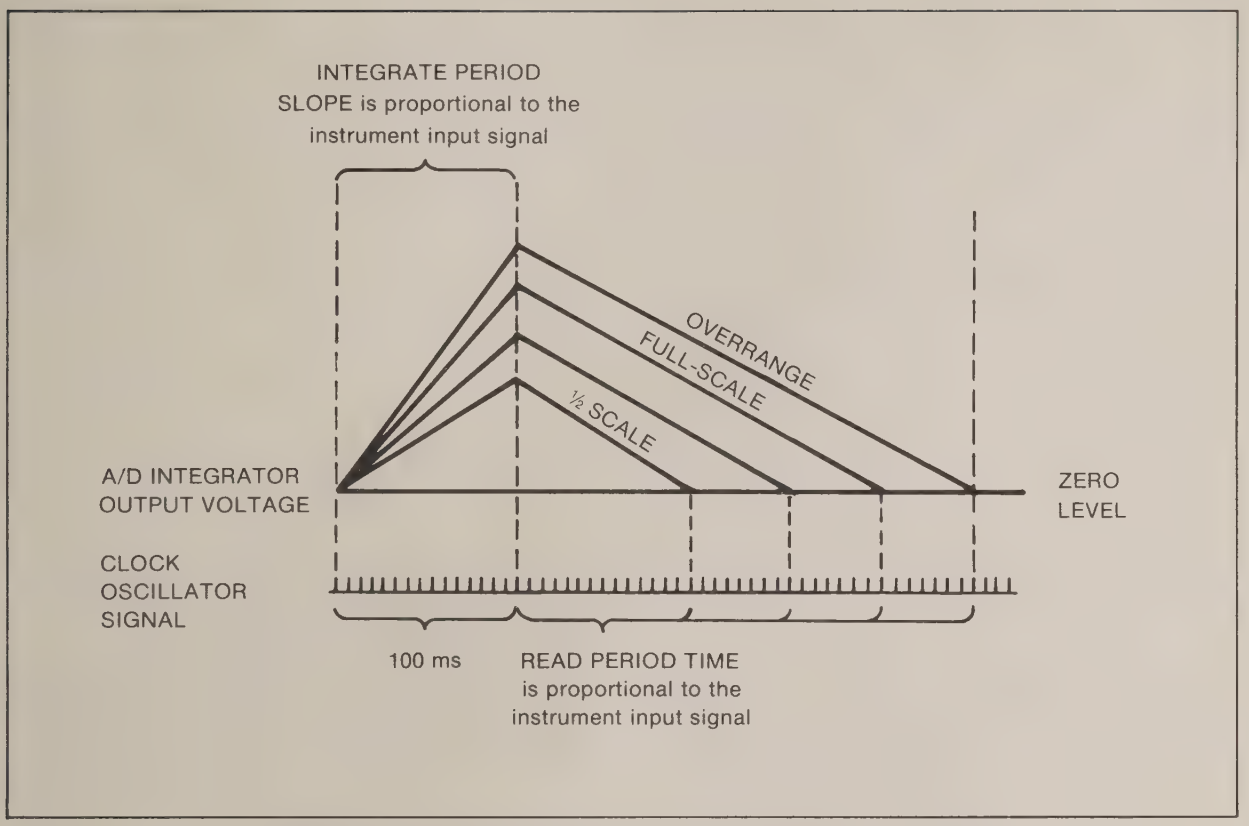


Figure 3-6. Dual Slope A/D Conversion Timing for VAC or VDC Inputs

Section 4
Maintenance

4-1. INTRODUCTION

4-2. This section of the manual contains information on service, general maintenance, performance tests, calibration, and troubleshooting. The performance test is recommended as a preventive maintenance tool and should be executed when it is necessary to verify that the instrument is operating within the specification limits. A calibration interval of 6 months is recommended to insure that the 8040A performs within the specifications stated in Section 1.

4-3. Table 4-1 lists the recommended test equipment necessary to maintain the 8040A. If the specified equipment is not available, other equipment having equivalent specifications may be used.

Table 4-1. Recommended Test Equipment

NOMENCLATURE	MINIMUM USE SPECIFICATIONS		RECOMMENDED EQUIPMENT
AC Calibrator	Voltage Range: Frequency Range: Voltage Accuracy:	0 to 750V ac 45 Hz to 120 kHz 45 Hz to 10 kHz....0.1% 10 kHz to 120 kHz....0.2%	John Fluke Model 5200A 5205A
DC Calibrator	Voltage Range: Accuracy:	0 to 1100V dc ±0.005%	John Fluke Model 3330B
DC Current Calibrator	Current Range: Accuracy:	0 to 2 mA 0.03%	John Fluke Model 3330B
DC Current Calibrator	Current Range: Accuracy:	2 mA to 2A 0.03%	John Fluke Model 382A
Digital Multimeter	DC Voltage Accuracy:	0.1%	John Fluke Model 8020A
Resistor Decade	Resistance Accuracy:	±0.04%	ESI DB62
Oscilloscope	General Purpose with 10 MΩ probe		Tektronix 465
Counter	±25 ppm at 1 MHz		John Fluke Model 1900A

4-4. SERVICE INFORMATION

4-5. The 8040A is warranted for a period of 1 year upon delivery to the original purchaser. Conditions of the warranty are given on the Warranty page in this manual.

4-6. Malfunctions that occur within the limits of the warranty will be corrected at no charge. Simply mail the instrument (postpaid) to your nearest authorized (in-warranty) Fluke Technical Service Center. A complete list of service centers are provided at the rear of this manual. Dated proof-of-purchase will be required for all in-warranty repairs.

4-7. Factory authorized service centers are also available for calibration and/or repair of instruments that are beyond their warranty period. Contact your nearest authorized Fluke Service Center for a cost quotation. Ship the instrument and remittance in accordance with instructions received.

4-8. GENERAL MAINTENANCE

4-9. Access Information

4-10. Use the following procedure to gain access to the interior of the 8040A:

1. Set the POWER switch to OFF and disconnect the Battery Charger/Eliminator, if attached.

2. Remove the fuse from the mA jack (press in, turn counterclockwise 1/4 turn to release).

3. Remove the two screws holding the battery holder to the rear of the instrument and remove the holder and batteries.

NOTE

The rechargeable batteries are secured to the battery holder and are removed as one unit.

4. Remove the screw from the center of the rear panel of the instrument case and slide the 8040A out of the case.

NOTE

Do not attempt to remove the sunshade when the 8040A is in the case. The sunshade does not have to be removed to slide the instrument out of the case.

CAUTION

There are two wires connecting the 8040A circuitry to the battery contacts in the case. Use care not to place excessive strain on these wires.

5. Unplug the battery power wires from the 8040A circuit board.

6. Loosen the two screws securing the circuit board to the top of the front panel. DO NOT REMOVE THEM!

7. Remove the two screws securing the circuit board to the bottom of the front panel.

8. Set the 8040A, front panel up, on a flat surface and gently lift the bottom edge of the front panel up to clear the switch buttons. Gently lay the switch and display sections of the A1 PCB down on the flat surface.

CAUTION

Do not bend the circuit board backwards past the flat position as damage to the flex joints may occur.

9. Remove the circuit shield covering the A4 (Input) PCB and switches for inspection or troubleshooting purposes. Two screws hold it in place.

10. The A4 PCB can be removed with upward pressure and a gentle rocking motion.

11. When reassembling the 8040A, protect the flexible lands by first folding the switch section of the A1 PCB then the display section up towards the vertical A2 and A3 PCBs. Tip the bottom edge of the front panel up to clear the switches. Insure that the A2 and A3 boards fit into the plastic board edge retainers on each side.

4-11. Cleaning

4-12. Clean the front panel and case with denatured alcohol or a mild solution of detergent and water. Clean dust from the circuit board with low pressure (less than 20 psi), dry air. Contaminates can be washed from the circuit board with demineralized water and a soft brush (avoid getting excessive amounts of water on the switches).

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These solutions will react with the plastic materials of the instrument.

4-13. Fuse Replacement

4-14. There are two fuses in the Model 8040A. F1, located behind the mA input jack, provides protection against current inputs that exceed 2 amps. When replacement is required, use only an AGX 2 amp fuse as a replacement. This fuse is removed by pressing in on the mA input terminal then turning it counterclockwise 1/4 turn to release. F2, located inside the rear case cover (Battery Pack Assembly cavity), provides protection against battery charging currents that exceed 3 amps. When replacement is required, use only a GFA-311, with the following procedure:

1. Remove the Battery Pack Assembly.
2. Unsolder the defective fuse.
3. Clip the leads on the repleacement fuse so that the fuse fits as close as possible to the case.
4. Solder the new fuse in place.
5. Replace the Battery Pack Assembly.

4-15. Required Method for Voltage Source Connection

4-16. When the instrument is opened for servicing, the reference voltage source connections to it must be made in the manner shown in Figure 4-1. This method is required for PERSONAL SAFETY. Since a DMM has no earth ground connection in itself, the earth ground connection must be supplied from the voltage source. The earth ground connection will insure that voltage potential, harmful to the calibration or repair technician, will not be present on the instrument's common circuits.

WARNING

INSURE THAT THE VOLTAGE SOURCE CONNECTION METHOD ILLUSTRATED IN FIGURE 4-2 IS USED. OTHER CONNECTION METHODS MAY CAUSE HAZARDOUS VOLTAGES TO BE PRESENT ON THE 8040A COMMON CIRCUITS.

4-17. mA Terminal Input Connections

4-18. When the instrument is opened for servicing, any input to the mA input terminal must be made in the manner shown in Figure 4-2. The fuse holder and fuse F1, should be physically inserted between the mA input terminal and the positive side of the double banana plug. The fuse will be held in place when the negative pin of the double banana plug is connected to the COMMON input terminal on the 8040A.

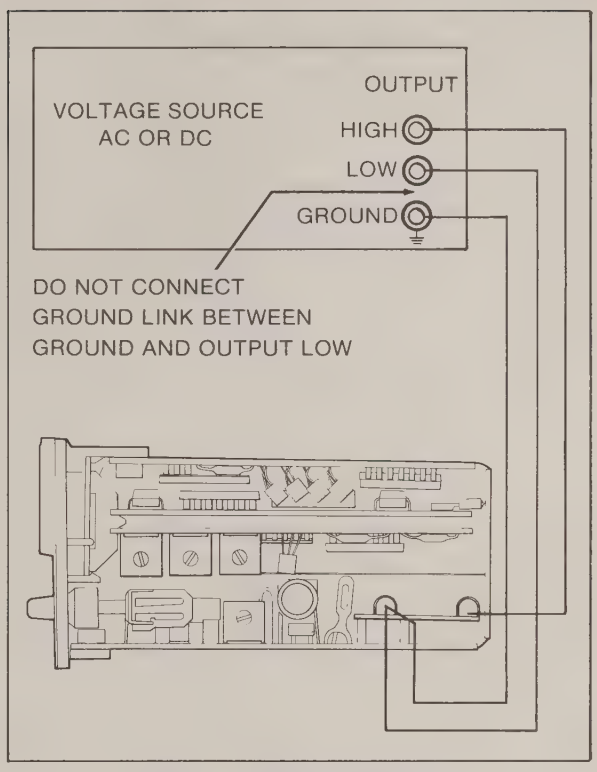


Figure 4-1. Required Method for Voltage Source Connection

4-19. PERFORMANCE CHECK

4-20. The performance check provides a means of verifying that the overall operation of the 8040A is within required limits. This procedure can be used as an acceptance test for receiving inspection and as a periodic maintenance check. Refer to Table 4-1 for the test equipment recommended for these checks. Should the 8040A fail to meet the requirements of these checks, calibrations, and/or troubleshooting will be necessary. Perform this procedure under environmental conditions of 23 ±5°C at relative humidity less than 80%.

WARNING

REFER TO THE REQUIRED METHOD FOR VOLTAGE SOURCE CONNECTION (THIS SECTION) FOR VOLTAGE SOURCE CONNECTION PROCEDURE.

4-21. DC Volts

4-22. This procedure requires the output of a dc voltage source (see Table 4-1), set to specified levels, to be applied to the 8040A V-Ω and COMMON inputs while the display is observed to be within specified limits. Select the DC V function then refer to Table 4-2 for the ranges and inputs for the performance check.

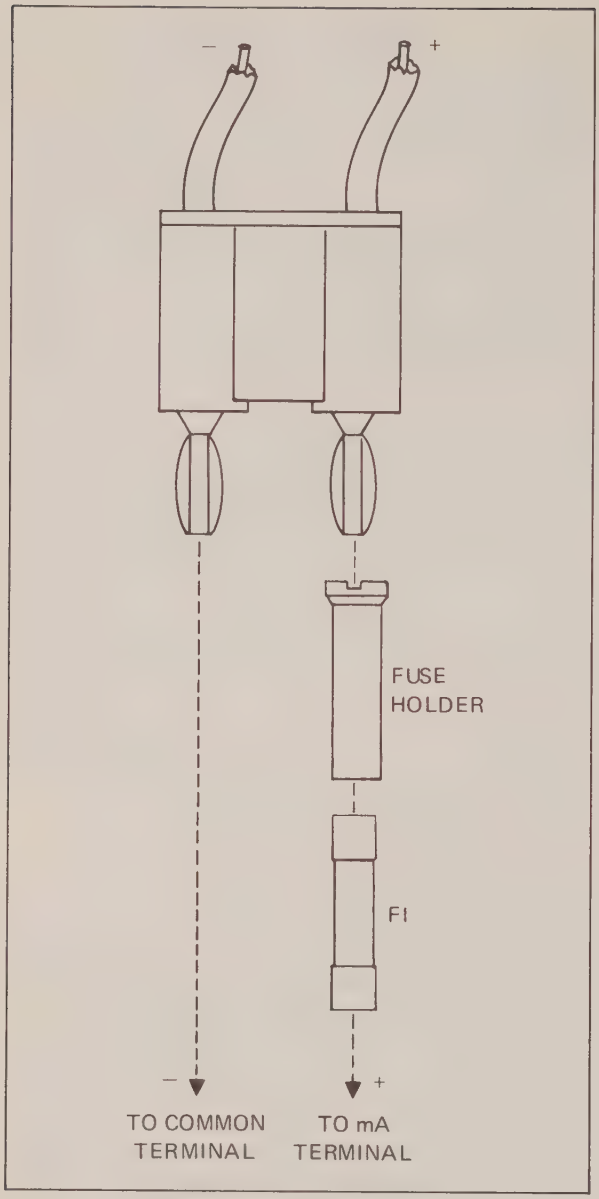


Figure 4-2. mA Connection

Table 4-2. DC Voltage Performance Check

8040A RANGE	DC VOLTS INPUT	8040A DISPLAY LIMITS
200 mV	190.00 mV	189.97 to 190.13
2	1.900V	1.8988 to 1.9012
2	0.90V	0.8993 to 0.9007
20	19.00V	18.988 to 19.012
20	9.00V	8.993 to 9.007
200	190.00V	189.88 to 190.12
200	50.00V	49.95 to 50 05
1100 dc	1000.00V	999.3 to 1000.7
1100 dc	450.00V	449.6 to 450.4

4-23. AC Volts

4-24. During this procedure ac voltage levels at specified frequencies are applied to the 8040A V-Ω and COMMON inputs and the displays observed to be within specified limits. Select the AC V function then refer to Table 4-3 for the ranges and inputs for the performance check.

Table 4-3. AC Voltage Performance Check

8040A RANGE	AC VOLTS INPUT	INPUT FREQ.	8040A DISPLAY LIMITS
200 mV	190.0 mV	50 Hz	188.00 to 192.00
200 mV	190.0 mV	5 kHz	188.95 to 191.05
200 mV	190.0 mV	20 kHz	188.00 to 192.00
2	1.900V	50 Hz	1.8800 to 1.9200
2	0.900V	10 kHz	0.8900 to 0.9100
2	1.900V	20 kHz	1.8800 to 1.9200
20	19.00V	50 Hz	18.800 to 19.200
20	8.00V	5 kHz	7.950 to 8.050
20	19.00	20 kHz	18.800 to 19.200
200	190.0V	50 Hz	188.00 to 192.00
200	190.0V	20 kHz	188.00 to 192.00
750	750V	50 Hz	741.5 to 758.5
750	750V	13 kHz	741.5 to 758.5

4-25. Resistance Measurements

4-26. This procedure calls for precision resistance to be applied to the 8040A V-Ω and COMMON inputs and the display observed to be within specified limits. Select the kΩ function then refer to Table 4-4 for the ranges and inputs for the performance check.

4-27. Direct Current

4-28. This procedure calls for known values of direct current to be applied to the 8040A mA and COMMON inputs and the display observed to be within specified limits. Select the DC mA function then refer to Table 4-5 for the ranges and inputs for the current check.

4-29. Alternating Current

4-30. The alternating current mode of operation need not be checked because the accuracy of the shunts is established by the direct current check and the frequency response is determined by the ac converter which is checked during the ac voltage check.

4-31. If a check of the AC mA function is desired, select the AC mA function and 2 range. Apply the +1.9 mA dc to the mA input. The displayed value should be between 1.9900 and 1.9200. A dc signal is used to check the AC mA function because the input is dc coupled.

Table 4-4. Resistance Performance Check

8040A RANGE	RESISTANCE INPUT	8040A DISPLAY LIMITS
AUTO	SHORT ①	00.00 to 00.03
AUTO	SHORT ②	Lead Res Value
AUTO	OPEN	Flashing +1.8888
2000 kΩ	1.0 MΩ	997.7 to 1002.3
200Ω	100Ω	99.77 to 100.23 ③
AUTO	1.00 kΩ	9977 to 1.0023 ③
AUTO	5.00 kΩ	4.987 to 5.013 ③
AUTO	10.0 kΩ	9.977 to 10.023 ③
AUTO	100 kΩ	99.77 to 100.23
AUTO	500 kΩ	498.7 to 501.3
AUTO	10.0 MΩ	9.947 to 10.053

① Use a good quality shorting bar between the V-Ω and COMMON input terminals.

② Connect the test leads that will be used to connect the 8040A to the decade resistance source. Place the short at the end to the test leads that will be connected to the resistance source. Note the resistance value indicated on the 8040A display.

③ Add the lead resistance value to the input resistance value to determine the correct 8040A display.

Table 4-5. Direct Current Performance Check

8040A RANGE	DIRECT CURRENT INPUT	8040A DISPLAY LIMITS
200 μA	+190.0 μA	+189.40 to +190.60
2	+1.900 mA	+1.8940 to +1.9060
20	+19.00 mA	+18.940 to +19.060
200	+190.0 mA	+189.40 to +190.60
2000	+1900 mA	+1894.0 to +1906.0

4-32. CALIBRATION

4-33. Calibration of the Model 8040A should be done after repairs have been made to the electronic circuitry or when the performance check indicates the unit is not operating within the specifications. Table 4-1 provides a list of test equipment required to calibrate this instrument. These procedures should be performed, in sequence, under environmental conditions of 23 ±5°C at a relative humidity of less than 80%. To avoid confusion, the 8040A being calibrated will be referred to as the UUT (Unit Under Test). The location of most test points and adjustments is shown in Figure 4-3.

4-34. When the UUT is opened for servicing, voltage source connections and inputs to the mA input terminal require special items as described earlier in this section in the General Maintenance Procedures as Required Method for Voltage Source Connection and mA Terminal Input Connections.

4-35. Initial Check Procedure

4-36. The Initial Check Procedure verifies that the power supply voltages are at the correct levels and that the oscillator clock is at the correct frequency. This is an optional procedure and should only be performed if repairs have been made or problems are suspected in these areas. Complete the following steps to perform the Initial Check Procedure:

1. On the Front Panel of the UUT, set the POWER switch to the OFF position.

2. Disconnect the UUT from the input power.

3. Remove the UUT case and unfold the Main PCB using the appropriate portions of the Access Information procedure presented earlier in this section.

4. Connect the UUT to input power.

5. On the Front Panel of the UUT, set the POWER switch to the ON position.

6. Use the DMM and Figure 4-4 to read the voltages at C11 and C12 on the Analog Converter PCB. C11 should be 10.8 to 12.2V dc.

7. Connect the Frequency Counter to U25 pin 6 on the Digital Conditioner PCB.

8. Verify that the clock oscillator frequency at U25, pin 6 is 1 MHz ±250 Hz.

9. On the Front Panel of the UUT, set the POWER switch to the OFF position.

10. Fold the Main PCB using the appropriate portion of the Access procedure.

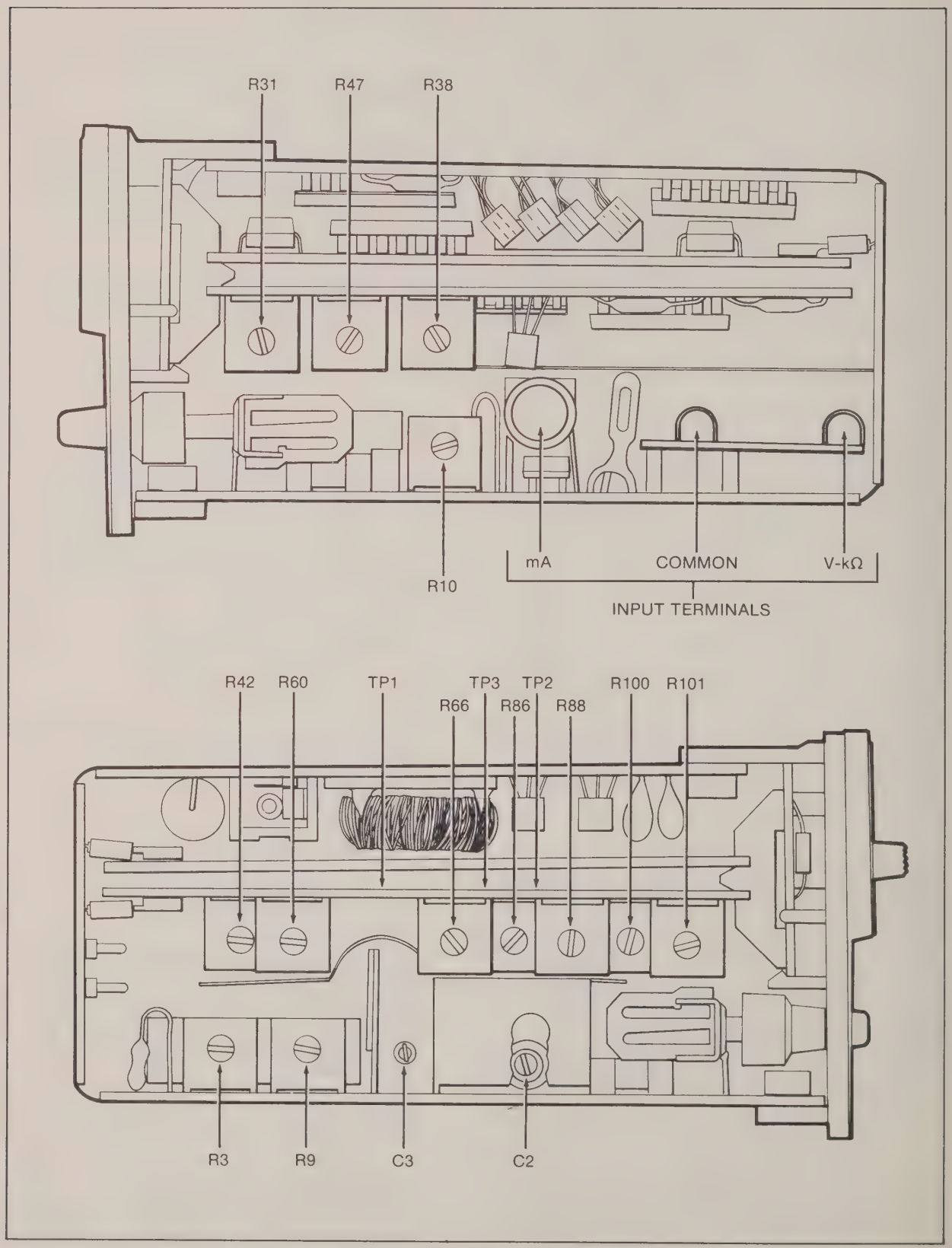


Figure 4-3. Location of Test Points and Adjustments

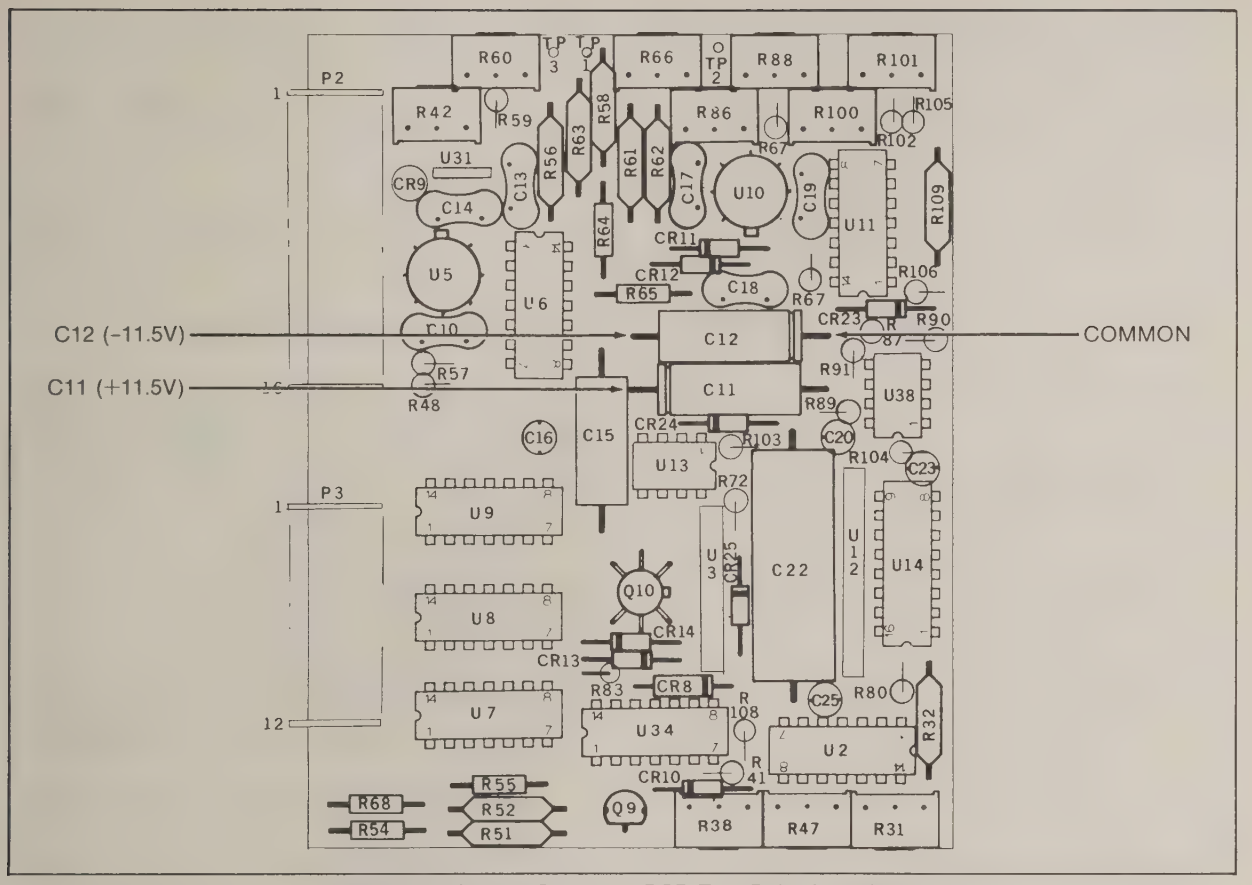


Figure 4-4. Analog Converter PCB Test Point Locations

4-37. DC Voltage Calibration

4-38. Use the following procedure to make the DC Voltage Calibration adjustments:

1. On the Front Panel of the UUT, select the VDC function, 200 mV range.

2. Verify on the UUT Display that the value is 00.00 ±75 digits and the lower unit's annunciator is illuminated.

3. On the Side Panel of the UUT, short the COMMON and V-Ω input terminals to each other.

4. Verify on UUT Display that the value is 00.00 ±1 digit and the lower unit's annunciator is illuminated.

5. On the side panel of the UUT, remove the short between the COMMON and V-kΩ input terminals.

4-39. Ohms Calibration

4-40. Perform both the Initial Calibration and DC Calibration procedures, then make the Ohms Calibration Adjustments using the following procedure:

1. On the Front Panel of the UUT, select the mA DC Function, 2 mA range.

2. Connect the DMM to the UUT: positive lead to TP1, negative lead to the UUT COMMON terminal.

3. Adjust R42 (BUFFER ZERO) for a DMM display of 0 ±1 mV dc.

4. On the Front Panel of the UUT, select the kΩ function, AUTO range.

5. Verify that the UUT Display is +18.888 and is flashing.

6. On the Side Panel of the UUT, short the COMMON and V-Ω terminals. Using a good quality shorting bar.

7. Verify that the UUT Display is 00.00 or 00.01.

8. Remove the short and connect the test leads between the COMMON and V-Ω terminals. Firmly connect the tips of the test leads together.

9. Record the UUT Display as lead resistance.

10. Connect the Resistor Decade to the UUT through the test leads.

11. Complete the Ohms Calibration by performing the following procedure for each step of Table 4-6, Part A, in sequence.

a. On the Front Panel of the UUT, select the Range listed in the Range column.

b. Set the Resistor Decade controls to the value listed in the Input column.

c. Rotate the component listed in the Adjustment column until the UUT Display agrees with the UUT Display columns.

12. Verify the Ohms Calibration adjustments by performing the following procedure for each step of Table 4-6, Part B, in sequence.

a. On the Front Panel of the UUT, select the Range listed in the Range column.

b. Set the Resistor Decade controls to the value listed in the Input column.

13. Verify that the UUT Display is within the limits of the Value column and that the annunciator status agrees with the condition listed in the Annunciator column.

4-41. VAC Midband Calibration

4-42. Perform the three preceding calibration procedures, then make the VAC Midband Calibration adjustment using the following procedures:

1. On the Front Panel of the UUT, select the mA AC function, 2 mV range.

2. Connect the DMM between TP1 and COMMON input terminal on the UUT.

3. Verify that the DMM Display is 0 ±1 mV dc.

4. Move the DMM connection from TP1 to TP2.

5. Adjust R66 (AC ZERO) for a UUT Display of 0 ±70 mV dc.

6. On the Side Panel of the UUT, connect the DC Calibrator as shown in Figure 4-5.

Table 4-6. Ohms Calibration

	RANGE	RESISTOR DECADE	ADJUSTMENT	UUT DISPLAY	
				VALUE	ANNUNCIATOR
A	2000 kΩ	1 MΩ	R47 (MΩ)	Exactly 1000.0	NONE
	200Ω	100Ω	R10 (100Ω)	Exactly 100.0 + lead resistance	μA-mV-Ω
	AUTO	1 MΩ	R47	Exactly 1000.0	NONE
	AUTO	100Ω	R10	Exactly 100.0 + lead resistance	μA-mV-Ω
B	AUTO	1.0 kΩ		.9977 to 1.0023	NONE
	AUTO	10 kΩ		9.977 to 10.023	NONE
	AUTO	100 kΩ		99.77 to 100.23	NONE
	AUTO	1.0 MΩ		997.7 to 1002.3	NONE
	AUTO	10 MΩ		9.947 to 10.053	MΩ
	AUTO	100 Ω		99.77 + lead resistance to 100.23 + lead resistance	μA-mV-Ω

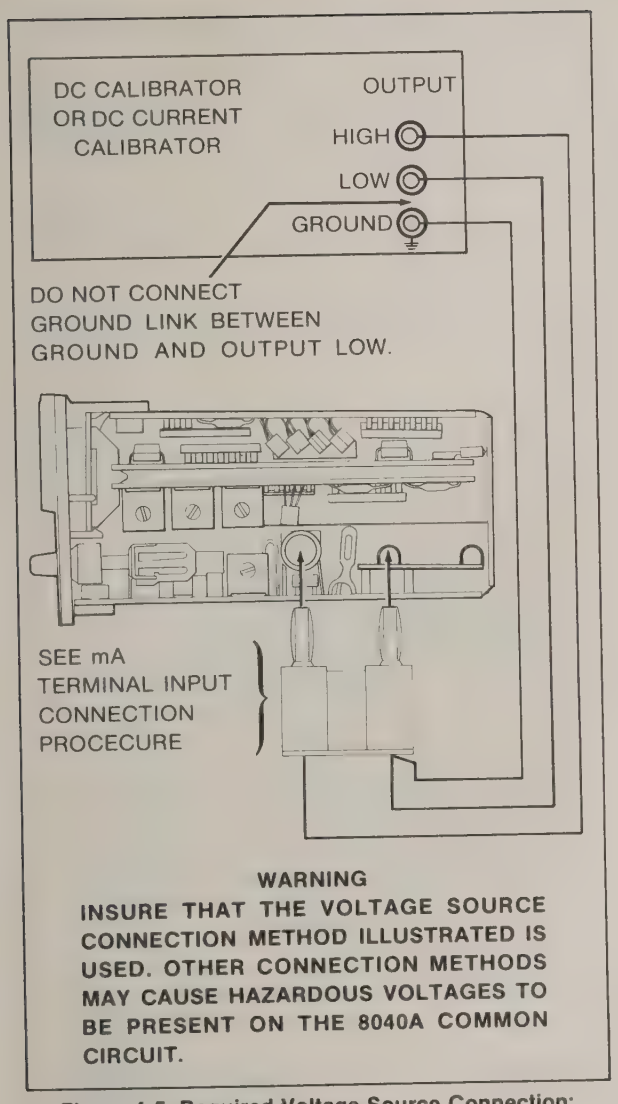


Figure 4-5. Required Voltage Source Connection: mA Terminal

7. Program the DC Calibrator for an input of +100 mV dc to the UUT.

8. Record the UUT Display numerical value.

9. Program the DC Calibrator for an input of -100 mV dc to the UUT.

10. Adjust R86 (SYMMETRY) so that the numerical value of the UUT Display agrees with the value recorded in step 8.

11. Repeat steps 4 through 10.

12. Disconnect the DC Calibrator from the UUT.

13. On the Front Panel of the UUT, select the VAC Function, 2V range.

14. On the Side Panel of the UUT, short the V-Ω input terminal to the COMMON input terminal.

15. Rotate R100 (100 mV AC) fully clockwise, then slowly counterclockwise until the UUT Display value is reduced to 150 ±30 digits.

16. Rotate R88 (BIAS ADJUST) fully counterclockwise.

17. Verify that the UUT Display stops changing as R88 reaches the full counterclockwise position.

18. Rotate R88 clockwise until the UUT Display changes by 1 or 2 digits.

19. On the Side Panel of the UUT, remove the short from the V-kΩ and COMMON input terminals.

20. Connect the DMM between TP2 and the COMMON input terminal.

21. Adjust R66 (AC ZERO) for a UUT Display of 0 ±70 mV dc.

22. On the Side Panel of the UUT, connect the AC Calibrator as shown in Figure 4-1.

23. Program the AC Calibrator for an input of 1.0000V, 200 Hz to the UUT.

24. Record the UUT Display value.

25. Program the AC Calibrator for an input to the UUT of 0.1000V, 200 Hz.

26. Adjust R100 (100 mV AC) until the UUT Display is one-tenth the value recorded in step 24.

27. Repeat steps 23 through 26 until the adjustment converges.

28. Program the AC Calibrator for an input to the UUT of 1.0000V, 200 Hz.

29. Adjust R101 (1.0V ac) for a UUT Display of exactly 1.0000.

NOTE

If R101 will not adjust the UUT Display to the correct value, especially if U11 has been replaced, select resistor R109 is probably not the correct value. Use the select resistor R109 procedure presented later in this section. After the correct value R109 is installed, return to step 29 of this procedure.

30. For each step in Table 4-7, Part A:

a. Program the AC Calibrator for a 200 Hz input to the UUT at the level indicated in the Voltage column.

b. Verify that the UUT Display lies within the range listed in the UUT Display column.

31. On the Front Panel of the UUT, select the AUTO range.

32. For each step in Table 4-7, Part B:

a. Program the AC Calibrator for a 200 Hz input to the UUT at the level indicated in the Voltage column.

b. Verify that the UUT Display lies within the range listed in the UUT Display column.

Table 4-7. VAC Midband Calibration

	VOLTAGE	UUT DISPLAY
A	0.1000V	99.40 -100.60
	0.0100V	9.85 - 10.15
	1.9000V	.9940 - 1.0060
B	10.0 mV	9.85 - 10.15
	100 mV	99.40 - 100.60
	1.00V	.9940 - 1.0060
	10.0V	9.940 - 10.060
	100V	99.40 - 100.60
	750V	745.2 - 754.8

33. Connect the equipment as shown in Figure 4-1.

34. Complete the DC Calibration adjustments by performing the following procedure for each step of Table 4-8, in sequence.

a. On the Front Panel of the UUT, select the range indicated in the Range column.

b. Program the DC Calibrator so that the input to the UUT is the value listed in the Input column.

c. Verify that the UUT Display is within the limits in the UUT Display column. The annunciators on the UUT Display should also agree with the condition indicated in the UUT Display Annunciator column.

d. If the UUT Display does not agree within the limits in the Value column, rotate the adjustment listed in the Adjustment column until the UUT Display is within the proper limits.

NOTE

If R31 will not adjust the UUT Display to the correct value, Select Resistor R32 is probably not the correct value. Use the Select Resistor R32 procedure presented later in this section. After the correct value R32 is installed, return to step 34 of this procedure.

Table 4-8. DC Voltage Calibration

RANGE	INPUT	ADJUSTMENT	UUT DISPLAY	
			VALUE	ANNUNCIATOR
2	-1.9000V	R31	Exactly -1.9000	-
2	+1.9000V	R38	Exactly +1.9000	-
2	0.0000V	-	-.0002 to +.0002	-
2	-1.9000V	-	-1.8988 to -1.9012	-
2	-1.8000V	-	-1.7989 to -1.8011	-
200 mV	+190.00 mV	R60	+189.99 to +190.01	mV Ω μA
200 mV	-190.00 mV	R60	-189.99 to -190.01	mV Ω μA
Repeat steps 8 and 9 until the tolerance is equal in each polarity.				
AUTO	+190.00V	R9	Exactly +190.00	-
AUTO	+1.9000V	-	+1.8988 to +1.9012	-
AUTO	+19.000V	-	+18.988 to +19.012	-
AUTO	OPEN	-	Test for autoranging	mV Ω μA
AUTO	+1000.0V	R3	Exactly 1000.0	-
AUTO	SHORT	-	Test for autoranging	mV Ω μA
AUTO	-1000.0V*	-	-999.3 to -1000.7	-

*Reverse the polarity of the applied input (1000 volts) by decreasing the voltage source output to zero, inverting the output lead at the voltage source output jacks, then increase the voltage to 1000 volts (see Required Method for Voltage Source Connection).

4-43. VAC Frequency Response Calibration

4-44. Perform all preceding calibration procedures, then make the VAC Frequency Response Calibration adjustments using the following procedure:

1. On the Front Panel of the UUT, select the VAC function, 750 VAC range.

2. Connect the AC Calibrator as shown in Figure 4-1.

3. Program the AC Calibrator for an input to the UUT of 500V, 10 kHz.

4. Adjust C3 (500V ac 10 kHz CAL) until the UUT Display is 499.7 to 500.3V ac.

5. If C3 lacks the adjustment range to bring the UUT Display to the correct value:

   a. Rotate C3 to the center of its travel.

   b. Adjust C24 until the UUT Display is as close as possible to 500.0 ±3 digits.

   c. Repeat step 4.

6. Program the AC Calibrator for an input to the UUT of zero volts.

7. On the Front Panel of the UUT, select the 200 range.

CAUTION

Make sure that you have not selected the 200 mV range. If you have, performing later steps may result in instrument damage.

8. Program the AC Calibrator for an input to the UUT of 100V, 10 kHz.

9. Adjust C2 (100V ac, 10 kHz) until the UUT Display is 99.96 to 100.04V ac.

10. Repeat steps 1 through 9 until the adjustments converge.

11. Verify calibration of the VAC function by performing the following procedure:

   a. On the Front Panel of the UUT, select the AUTO range.

   b. For each step in Table 4-9:

      1) Program the AC Calibrator for the UUT input listed in the Input column.

      2) Verify that the UUT Display is within the range listed in the UUT Display column.

Table 4-9. VAC Calibration Check

INPUT		UUT DISPLAY
VOLTAGE	FREQUENCY	
100 mV	20 kHz	98.90 - 101.10 mV
1.00V	20 kHz	.9890 - 1.0110V
10.0V	20 kHz	9.890 - 10.110V
100V	20 kHz	98.90 - 101.10V
500V	20 kHz	494.0 - 506.0V
500V	5 kHz	496.5 - 503.5

4-45. Current Calibration

4-46. Performance of the preceding calibration procedures calibrates both the mA AC and mA DC functions. After all preceding calibration procedures have been performed, use the following procedure to verify calibration of the two current measurement functions:

1. On the Front Panel of the UUT, select the mA AC function, 2 mA range.

2. Connect the equipment as shown if Figure 4-5.

3. Program the DC Current Calibrator for an input to the UUT of +1.9 mA dc.

4. Verify that the UUT Display is 1.8950 to 1.9050 mA.

5. On the Front Panel of the UUT, select the mA DC function.

6. For each step in Table 4-10:

   a. On the Front Panel of the UUT, select the range listed in the Range column.

   b. Program the DC Current Calibrator for the input to the UUT listed in the Input column.

   c. Verify that the UUT Display is within the limits listed in the UUT Display column.

Table 4-10. Direct Current Accuracy Check

RANGE	INPUT	DISPLAY
200 μA	+190 μA	+189.40 to +190.60
2 mA	+1.9 mA	+1.8940 to +1.9060
20 mA	+19 mA	+18.940 to +19.060
200 mA	+190 mA	+189.40 to +190.60
2000 mA	1900 mA	+1894.0 to +1906.0

4-47. Final Calibration Adjustment

4-48. Use the following procedure to adjust R29 - located inside the DMM:

1. On the Front Panel of the DMM, set the POWER switch to the OFF position.

2. Disconnect the UUT from the input power.

3. Unfold the Main PCB using the appropriate portion of the Access Information procedure presented earlier in this section.

4. Connect the UUT to input power.

5. On the Front Panel of the UUT, set the POWER switch to the ON position.

6. Connect the AC Calibrator as shown in Figure 4-1.

7. Program the AC Calibrator for a UUT input of 1.000V, 10 kHz.

8. Adjust R29 until the UUT Display is .9999 to 1.0001V ac.

9. Set the POWER switch to the OFF position.

10. Fold the instrument using the appropriate part of the Access Information presented earlier in this section.

11. Set the POWER switch to the ON position.

4-49. CALIBRATION VERIFICATION

4-50. Opening and folding the Main PCB may affect the UUT calibration. Complete the Performance Checks to verify the calibration.

4-51. SELECT RESISTOR DETERMINATION

4-52. The values of two resistors, R32 and R109, on the Analog Converter PCB are selected to compensate for circuit differences when components are changed. If U11 is replaced, perform the Select Resistor R109 procedure. If U2 is replaced, perform the Select Resistor R32 procedure. The UUT should be calibrated in either case.

4-53. Select Resistor R32

4-54. Use the following procedure to select the correct value of R32 on the Analog Converter PCB. This procedure assumes the UUT has the case cover removed and the Main PCB opened flat.

1. On the Front Panel of the UUT, select the VDC function, 2V range.

2. Rotate R31 to the center of its range of travel.

3. Use an alligator clip jumper to short R32.

4. Connect the DC Calibrator as shown in Figure 4-1.

5. Program the DC Calibrator for a UUT input -1.0000V dc.

6. Record the UUT Display value.

7. Replace the present R32 with the value resistor listed in Table 4-11 corresponding to the value recorded in step 6.

8. Calibrate the UUT.

Table 4-11. Select Resistor R32

UUT DISPLAY	RESISTOR (Ω)	FLUKE P/N
.9986 - 1.0015	0	Bus Wire
.9956 - .9985	15.0	296434
.9976 - .9955	30.1	296665
.9896 - .9925	45.3	296749
.9866 - .9895	60.4	235366
.9836 - .9865	75.0	306027
.9806 - .9835	90.9	306068
.9776 - .9805	105	236760
.9746 - .9775	121	343160
.9716 - .9745	137	235218
.9686 - .9715	147	288415
.9656 - .9685	169	236869
.9626 - .9655	182	289579
.9696 - .9625	200	245340
.9566 - .9595	210	327999
.9536 - .9565	226	325654

4-55. Select Resistor R109

4-56. Use the following procedure to select the correct value of R109 on the Analog Converter PCB. This procedure assumes the UUT has the case cover removed and the Main PCB opened flat.

1. On the Front Panel of the UUT, select VAC function, 2V range.

2. Rotate R101 to the center of its range of travel.

3. Use an alligator clip jumper to short R109.

4. Connect the AC Calibrator as shown in Figure 4-1.

5. Program the AC Calibrator for a UUT input of 1.0000V, 200 Hz.

6. Record the UUT Display value.

7. Replace the present R109 with the value resistor listed in Table 4-12 corresponding to the value recorded in step 6.

8. Calibrate the UUT.

Table 4-12. Select Resistor R109

READING	RESISTOR (kΩ)	FLUKE P/N
.9935 - 1.0069	0	Bus Wire
.9802 - .9932	1.00	168229
.9676 - .9801	2.00	235226
.9555 - .9675	3.01	312645
.9438 - .9554	4.02	235325
.9326 - .9437	5.11	294868
Below .9326	6.04	162586

4-57. TROUBLESHOOTING

4-58. The following information should be kept in mind while doing repair work on the 8040A. Inattention to these precautions may lead to instrument damage.

1. MOS type integrated circuits can be damaged by discharging static electricity through the device. On the A1 PCB the integrated circuits which are susceptible to damage are U22, U25 and U28; on the A2 PCB the sensitive components are U15 through U21, U23, U24 and U26; on the A3 PCB, U6, U7, U8 and U9; and A4 and A5 PCBs do not include MOS circuits.

CAUTION

To avoid damaging MOS devices you should observe the precautions on the Static Awareness sheet.

2. The 8040A uses flexible connectors for physical and electrical connection of the individual sections of the A1 PCB. These flexible connectors should never be unfolded past the flat position. Reverse flexing of these connectors can damage the solder joints.

3. The physical position of some components may affect the ac calibration of the instrument. The position of resistor network U33 and the internal shield are most likely to change the calibration if their positions were changed.

4. The low side of the charger/eliminator connector will always be at the same voltage level, with respect the earth ground, as the COMMON input terminal.

4-59. The figures presented herein the troubleshooting section, are of signal waveforms taken at selected points in the 8040A circuitry. The amplitude of the signal and the time duration of some segments of the waveform are directly related to the input applied to the 8040A. When the input required for each figure is applied to the 8040A, the manner in which the actual waveform deviates from the expected will indicate the probable cause for the malfunction.

4-60. The oscilloscope must be triggered from the signal at U26 pin 8 when observing the waveforms presented in these troubleshooting figures. Set the oscilloscope trigger level to positive and trigger slope to positive. Connect the external trigger level lead to U26 pin 8.

4-61. The signals pictured in Figure 4-6 show the two basic timing sequences of the integrate (INT) signal; waveform A for any in-range input, waveform B for any overrange input. Connect the oscilloscope input to U26 pin 8. Connect the scope ground lead to the 8040A switch frame. Exercise the 8040A in the following manner and observe the oscilloscope for the appropriate waveform.

1. Select the kΩ function and 2 range.

2. Connect a short between the V-Ω and COMMON input terminal.

3. The oscilloscope should display waveform A.

4. Remove the short. The instrument will indicate an overrange condition (flashing +1.8888) and the oscilloscope display will change to waveform B.

4-62. The probable area in the 8040A circuitry causing a malfunction that affects the INT signal may be indicated by the action of the signal under the two input conditions. The following are possible problem areas based upon the action of the INT signal.

1. If the INT signal remains constant at approximately +7 volts or -7 volts, look at U26 pin 9 for the INT signal (opposite polarity to the INT signal). If the INT signal is on pin 9, U26 is defective. If the signal is not at pin 9 go on to the next waveform check.

2. If, when an overrange input is applied to the 8040A input, the waveform at U26 pin 8 does not change from A to B proceed to the next waveform check to further define the problem area.

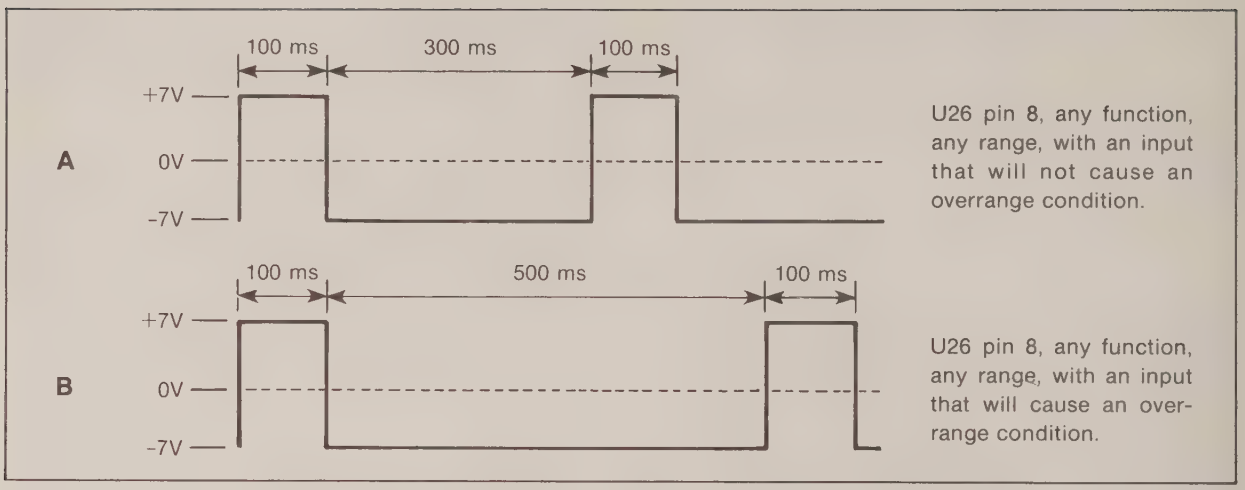


Figure 4-6. Waveforms at U26 Pin 8, for In-Range and Overrange Inputs

4-63. The waveforms presented in Figure 4-7 represent the operation of the analog circuitry in four key locations, with an in-range and overrange input applied to the 8040A. These points are; TP1 the buffer amplifier output, Q10 gate (same as U2 pin 7) the unity gain amplifier in the A/D Converter, C22 (same as U2 pin 1) the output of the integrator amplifier and U14 pin 3 the compare signal (CM) sent to the digital circuitry. (See Figure 4-8 for oscilloscope connection points on the 8040A boards.) Check the waveforms at these points as follows:

1. Select the VDC function and 2 range.

2. Apply 1.0V dc to the V-Ω input.

3. Connect the oscilloscope input to TP1.

4. The oscilloscope display should be similar to waveform A1 in Figure 4-7.

5. Change the voltage applied to the V-Ω input to 2.5 volts.

6. The oscilloscope display should be similar to waveform B1.

NOTE

If the amplitude of the first 100 ms of either oscilloscope display significantly deviates from waveform A1 or B1, the malfunction is probably in the Buffer circuit (Q1 through Q8, Q11, U5 and U4) or the associated circuitry. If the amplitude is correct and the duration of the second segment of the waveform is incorrect, go on to the next step.

7. Connect the oscilloscope input to the gate of Q10 (on the schematic this is the same as U2 pin 7).

8. The oscilloscope display should be similar to waveform B2.

9. Change the voltage applied to the V-Ω input to 1.0 volt.

10. The oscilloscope display should be similar to waveform A2.

NOTE

If the amplitude of the first 100 ms of either oscilloscope display significantly deviates from waveform B2 or A2 the malfunction is probably in Q10, U2, U8 and U9. If the amplitude is correct and the duration of the second segment of the waveform is incorrect, go on to the next step.

11. Connect the oscilloscope input to the left end of C22.

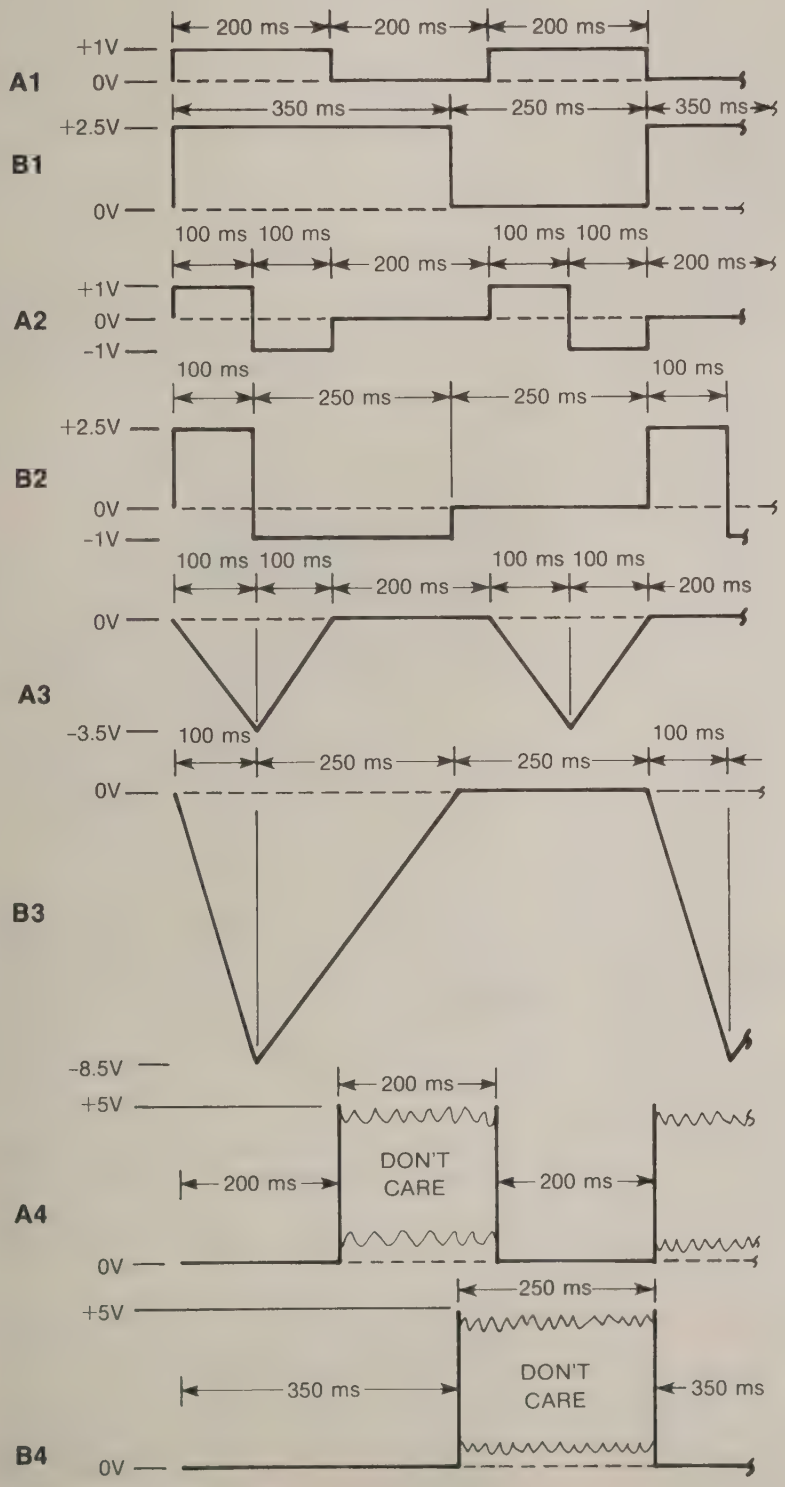
12. The oscillscope display should be similar to waveform A3.

13. Change the voltage applied to the V-Ω input to 2.5 volts.

14. The oscilloscope display should be similar to waveform B3.

NOTE

If the amplitude of the first 100 ms of either oscilloscope display significantly deviates from waveform A3 or B3, U2 is the probable cause of the malfunction. If the amplitude is correct and the duration of the second segment of the waveform is incorrect, go on to the next step.



TP1, VDC function, 2 range, 1.0V dc applied to V-Ω input.

TP1, VDC function, 2 range, 2.5V dc applied to VΩ input.

Q10 gate, VDC function, 2 range, 1.0V dc applied to V-Ω input.

Q10 gate, VDC function, 2 range, 2.5V dc applied to V-Ω input.

C22, VDC function, 2 range, 1.0V dc applied to V-Ω input.

C22, VDC function, 2 range, 2.5V dc applied to V-Ω input.

U14 pin 3, VDC function, 2 range, 1.0V dc applied to V-Ω input.

U14 pin 3, VDC function, 2 range, 2.5V dc applied to V-Ω input.

Figure 4-7. Waveforms at TP1, Q10, C22, and U14 for In-Range and Overrange Inputs

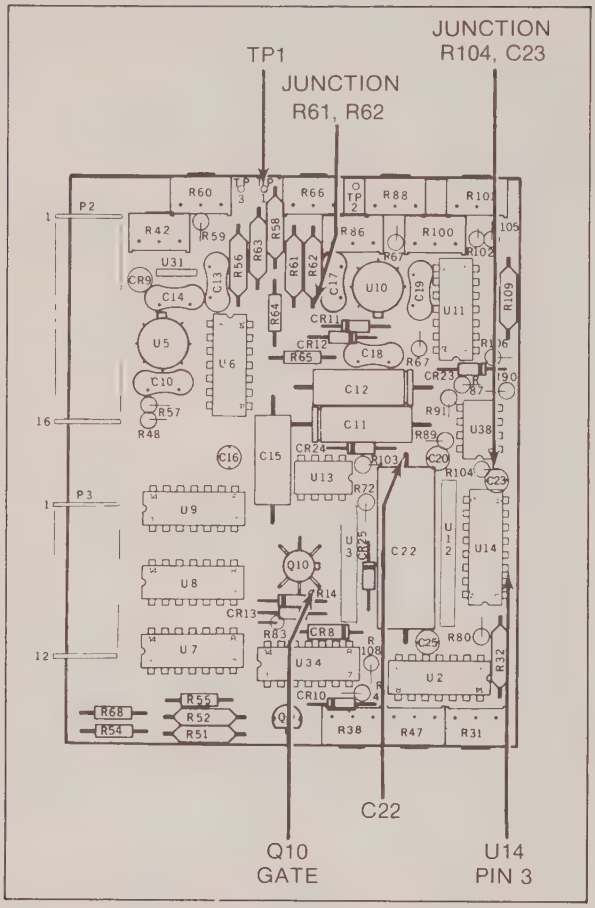


Figure 4-8. Oscilloscope Connections for Troubleshooting

15. Connect the oscilloscope input to U14 pin 3.

16. The oscilloscope display should be similar to waveform B4.

17. Change the voltage applied to the V-Ω input terminal to 1.0 volt.

18. The oscilloscope display should be similar to waveform A4.

NOTE

If either oscilloscope display significantly deviates from waveform B4 or A4, the malfunction is probably in U14 or U22.

4-64. The voltage level of the first 100 ms segment of waveforms A2 and B2 should be very close to 1.0 volt and 2.5 volts, respectively. If this is true, yet the amplitude of the second segment of the waveform, –1.0 volts in either case, is incorrect the malfunction is probably in the A/D Reference Supply circuitry. Sections of solid state switches U7 or U8 may be leaky or inoperative or U2 may be defective.

4-65. When a malfunction affects the AC V function, the probable cause of the malfunction is either the AC Converter circuitry or in the switches U7 or U9. The operation of the AC Converter should be checked as follows:

1. Select the AC V function and 2 range.

2. Apply a 1.0 volt rms signal at 200 Hz to the V-Ω input.

3. Connect the oscilloscope input TP1.

4. The oscilloscope display should show a 200 Hz signal with the positive peak being approximately +1.4 volts and the negative excursion being approximately –1.4 volts.

5. Connect a voltmeter to the junction of R104 and C23, it should indicate +1.0 volt dc.

6. If the voltage at R104 is not +1.0 volt dc, connect the oscilloscope input to the junction of R61 and R62.

7. The oscilloscope display should show a +1.4 volt half wave rectified signal.

NOTE

If the signal at the junction of R61 and R62 is not correct, U10 is the probable faulty component. If it is correct, then U38, U11, or U13 may be the faulty component.

4-66. Malfunctions in the Digital circuitry may be indicated by the manner in which the 8040A display is affected. Some of the display symptoms and the probable cause for each are as follows:

1. Decimal point inoperative. Probable cause, Q13 defective.

2. Overload indication (flashing 1888) inoperative. Probable cause, U14 defective.

3. All display digits indicate zeros. Probable cause, U25 defective.

4. mV•Ω•μA or MΩ annunciator inoperative. Probable cause, U22 or DS8 defective.

5. Any individual digit not illuminated. Probable cause, the LED for that digit (DS1 through DS6) or the respective driver transistor (Q15 through Q19) is defective.

6. All digits are blank. Probable cause, U25, U27, U30 or U29 defective.

Section 5
List of Replaceable Parts

TABLE OF CONTENTS

DESCRIPTION	DRAWING NO.	TABLE NO.	TABLE PAGE	FIGURE NO.	FIGURE PAGE
8040A Final Assembly	8040A-01	5-1	5-3	5-1	5-4
A1 Main PCB Assembly	8040A-1604, ph 2	5-2	5-6	5-2	5-9
A2 Digital Conditioner PCB Assembly	8040A-1602	5-3	5-10	5-3	5-11
A3 Analog Converter PCB Assembly	8040A-1601	5-4	5-12	5-4	5-14
A4 Volt-Ohm Input PCB Assembly	8040A-1603	5-5	5-15	5-5	5-15
A6 Case Assembly	8040A-4202	5-6	5-16	5-6	5-16
A7 Battery Pack Assembly	8040A-7004K	5-7	5-17	5-7	5-17

5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. A similar parts listing for each of the options will be found in Section 6. Components are listed alphanumerically by assembly. Both electrical and mechanical components are listed by reference designation. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

1. Reference Designation.

2. Description of each part.

3. FLUKE Stock Number.

4. Federal Supply Code for Manufacturers. (See Section 7 for Code-to-Name list.)

5. Manufacturer's Part Number.

6. Total Quantity per assembly or component.

7. Recommended Quantity: This entry indicates the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one of each assembly in the instrument be stocked. In the case of optional subassemblies, plug-ins, etc., that are not always part of the instrument, or are deviations from the basic instrument model, the REC QTY column lists the recommended quantity of the item in that particular assembly.

5-4. HOW TO OBTAIN PARTS

5-5. Components may be ordered directly from the manufacturer by using the manufacturer's part number, or from the John Fluke Mfg. Co., Inc. factory or authorized representative by using the FLUKE STOCK NUMBER. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions if necessary.

5-6. To ensure prompt and efficient handling of your order, include the following information.

1. Quantity.

2. FLUKE Stock Number.

3. Description.

4. Reference Designation.

5. Printed Circuit Board Part Number.

6. Instrument Model and Serial Number.

CAUTION

Indicated devices are subject to damage by static discharge.

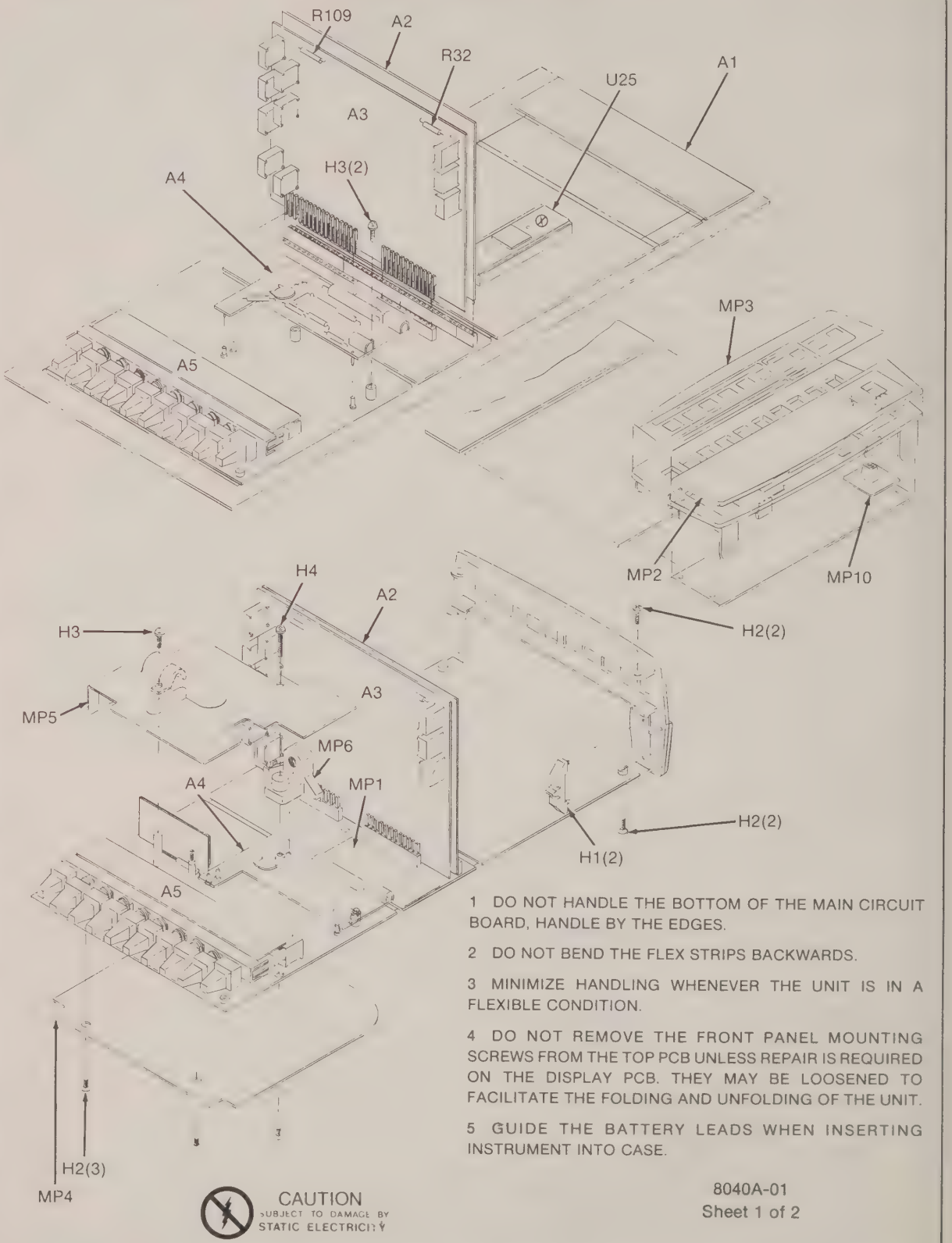
Table 5-1. 8040A Final Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A	Ⓟ8040A FINAL ASSEMBLY (STANDARD) FIGURE 5-1						
A1	MAIN PCB ASSEMBLY FIGURE 5-2	ORDER	ONLY	REPLACEABLE PARTS	1		
A2	DIGITAL CONDITIONER PCB ASSEMBLY FIGURE 5-3	ORDER	ONLY	REPLACEABLE PARTS	1		
A3	ANALOG CONVERTER PCB ASSEMBLY FIGURE 5-4	ORDER	ONLY	REPLACEABLE PARTS	1		
A4	VOLT-OHM INPUT PCB ASSEMBLY FIGURE 5-5	ORDER	ONLY	REPLACEABLE PARTS	1		
A5	SWITCH INTERCONNECT PCB ASSEMBLY	SEE	A1	MAIN PCB ASSEMBLY			
A6	CASE ASSEMBLY	ORDER	ONLY	REPLACEABLE PARTS	1		
A6.	--FIGURE 5-6 (8040A-4202)						
A7	BATTERY PACK ASSEMBLY (STANDARD)	430959	89536	430959	1		3
A7.	--FIGURE 5-7						
A7.1	BATTERY PACK ASSEMBLY-RECHARGEABLE	SEE	SEC.6	OPTION -01			
A81	BATTERY ELIMINATOR/CHARGER	SEE	SEC.6	ACCESSORIES	1		
F1	FUSE, 2 AMP, 250V AGX	376582	71400	AGX2	1	5	
H1	RETAINERS, PCB	426429	89536	426429	2		
H2	SCREW, FHP, 4-40 X 1/4	320077	89536	320077	7		
H3	SCREW, PHP, 4-40 X 1/4	256156	89536	256156	1		
H4	SCREW, PHP, 4-40 X 1/2	256172	89536	256172	1		
H5	SCREW, FHP, 4-40 X 3/8	276709	89536	276709	2		
H6	SCREW, PHP, 8-32 X 1/2	256206	89536	256206	1		
MP2	LENS, DISPLAY	426361	89536	426361	1		
MP3	DECAL, FRONT PANEL	419309	89536	419309	1		
MP4	SHIELD, PCB, MAIN	426593	89536	426593	1		
MP5	SHIELD, CIRCUIT	426395	89536	426395	1		
MP6	MOUNTING BRACKET, CIRCUIT SHIELD	426445	89536	426445	1		
MP9	TEST LEADS	484055	89536	484055	1		
MP10	BUTTON, POWER	425975	89536	425975	1		
MP11	INSULATOR, HIGH VOLTAGE	453852	89536	453852	1		
R32	RES, ASSY, MATCHED SET (CR8, R32, U34)	456426	89536	456426	1		1
R109	IC, RES, ASSY, SELECTED (U11, R109)	456434	89536	456434	1		2
U25	Ⓟ IC, P-MOS, DTL, DVM, LOGIC	407734	70203	C2506/407734	1	1	
XF1	FUSE CLIP, MA INPUT TERMINAL	426627	89536	426627	1		
	MANUAL, MAINTENANCE (NOT SHOWN)	427138	89536	427138	1		
	MANUAL, OPERATORS (NOT SHOWN)	427146	89536	427146	1		

1 MATCHED SET ASSY (CR8, R32, U34). ON A3 ANALOG CONVERTER ASSY.

2 SELECTED IC, RESISTOR ASSY (U11, R109). ON A3 ANALOG CONVERTER ASSY.

3 SEE SECTION 6 FOR -01 OPTION RECHARGABLE BATTERY PACK.



1 DO NOT HANDLE THE BOTTOM OF THE MAIN CIRCUIT BOARD, HANDLE BY THE EDGES.

2 DO NOT BEND THE FLEX STRIPS BACKWARDS.

3 MINIMIZE HANDLING WHENEVER THE UNIT IS IN A FLEXIBLE CONDITION.

4 DO NOT REMOVE THE FRONT PANEL MOUNTING SCREWS FROM THE TOP PCB UNLESS REPAIR IS REQUIRED ON THE DISPLAY PCB. THEY MAY BE LOOSENED TO FACILITATE THE FOLDING AND UNFOLDING OF THE UNIT.

5 GUIDE THE BATTERY LEADS WHEN INSERTING INSTRUMENT INTO CASE.

8040A-01
Sheet 1 of 2

Figure 5-1. 8040A Final Assembly

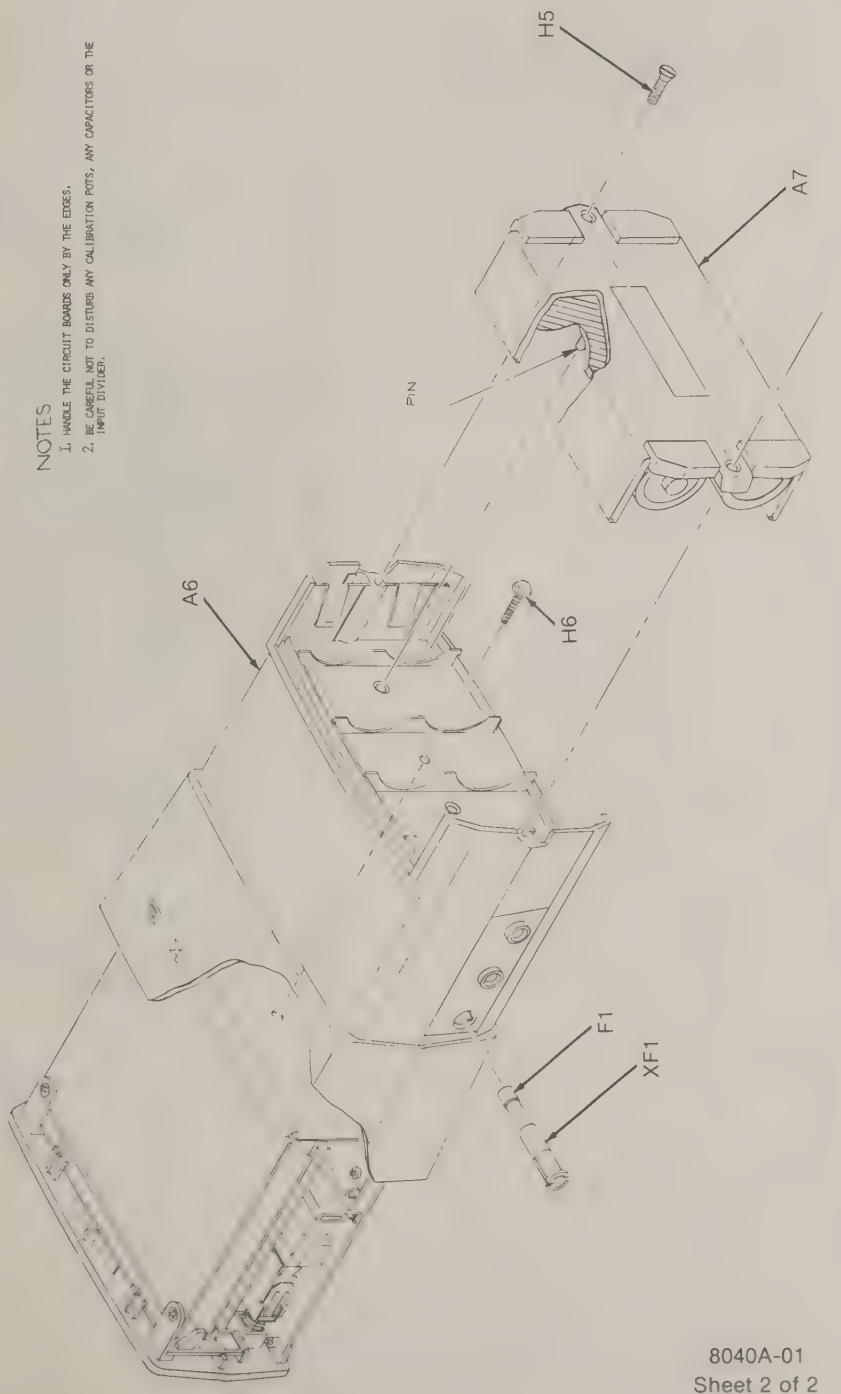


Figure 5-1. 8040A Final Assembly (cont)

Table 5-2. A1 Main PCB Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	MAIN PCB ASSEMBLY FIGURE 5-2 (8040A-4004)	ORDER	ONLY	REPLACABLE PARTS	REF		
A5	SWITCH INTERCONNECT PCB ASSEMBLY	427542	89536	427542	1		
C1	CAP, CER, 50,000 PF -20/+80%, 500V	105676	56289	33C58	1		
C2	CAP, VAR, CER, 5-50 PF	404301	56289	GKC50000	1		
C3	CAP, VAR, 1.5 TO 0.25 PF, 2000V	435016	72982	530-006	1		
C4	CAP, MICA, 270 PF +/-5%, 500V	148452	72136	DM15F271J	1		
C5	CAP, MICA, 3000 PF +/-1%, 500V	436188	72136	DM19F302F	1		
C6	CAP, FILM, 0.047 UF +/-10%, 250V	162008	73445	C280MAE/A47K	1		
C7	CAP, POLYCARBONATE, 0.10 UF +/-10%, 100V	376251	73445	C280MCH/A100K	1		
C8	CAP, CER, 33 PF +/-5%, 500V	354852	80031	2222-638-10339	1		
C9	CAP, FILM, 0.47 UF +/-10%, 100V	369124	73445	C280MAH/A470K	1		
C21	CAP, ELECT, 100 UF -10/+50%, 10V	170456	56289	150D107X9010R	1		
C24	CAP, VAR, 1.5 TO 0.25 PF, 2000V	218206	72982	530-000	1		
C26	CAP, TA, 5.6 UF +/-20%, 25V	368969	56289	196D565X0025KA1	1		
C27	CAP, TA, 2.2 UF +/-20%, 20V	161927	56289	196D225X0020HA1	1		
C28	CAP, ELECT, 150 UF -10/+50%, 16V	186296	73445	ET151X016A5	2		
C29	CAP, ELECT, 150 UF -10/+50%, 16V	186296	73445	ET151X016A5	REF		
CR1	RECTIFIER BRIDGE, 1.5 AMP	428151	04713	MDA920A1	1		
CR2	DIODE, SI, RECTIFIER, 1 AMP	428144	04713	1N4006	2		
CR3	DIODE, SI, RECTIFIER, 1 AMP	428144	04713	1N4006	REF		
CR4	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	8	2	
CR5	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR6	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR7	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR15	DIODE, SI, RECTIFIER, 1 AMP	343491	04713	1N4002	1		
CR16	DIODE, ZENER, 13V	110726	07910	1N964B	1	1	
CR17	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR18	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR24	DIODE, SI, RECTIFIER, 2 AMP	347559	05277	1N5400	1	1	
CR26	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR27	DIODE, SI, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
DS1	DISPLAY, LED	495457	28480	QDSP3507	1		
DS2	DISPLAY, LED	495440	28480	QDSP3515	5		
DS3	DISPLAY, LED	495440	28480	QDSP3515	REF		
DS4	DISPLAY, LED	495440	28480	QDSP3515	REF		
DS5	DISPLAY, LED	495440	28480	QDSP3515	REF		
DS6	DISPLAY, LED	495440	28480	QDSP3515	REF		
H1	STRAP	457713	89536	457713	1		
H2	SPACER, DISSOPAD (NOT SHOWN)	296319	32559	T0-8-06	3		
H3	CONNECTOR, POST	376574	00779	3-87022-1	1		
H4	CONNECTOR, POST (NOT SHOWN)	375337	00779	87022-4	1		
J1	SOCKET, 20-PIN	485045	30035	SS109-1-20C	2		
J2	SOCKET, 16-PIN	485037	30035	SS109-1-16C	1		
J3	SOCKET, 12-PIN	485029	30035	SS109-1-12C	1		
J6	JACK, CONNECTOR	435610	89536	435610	3		
J7	JACK, CONNECTOR	435610	89536	435610	REF		
J9	JACK, CONNECTOR	435610	89536	435610	REF		
J14	JACK, DC POWER	423897	89536	423897	1		
K1	RELAY	459891	89536	459891	1		

Table 5-2. A1 Main PCB Assembly (cont)

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
K2	RELAY	424408	89536	424408	2		
K3	RELAY	424408	89536	424408	REF		
MP1	BUTTON, FUNCTION SWITCH (S1-S4)	425900	89536	425900	4		
MP2	BUTTON, RANGE SWITCH (S5-S10)	426759	89536	426759	6		
MP3	SPACER, SWITCH	427849	89536	427849	4		
MP4	SHIELD, SWITCH (NOT SHOWN)	426411	89536	426411	1		
MP5	INTERCONNECT, DISPLAY	433649	89536	433649	1		
MP6	INTERCONNECT, ANALOG/DIGITAL	433631	89536	433631	2		
Q1	XSTR, J-FET, N-CHANNEL	429977	89536	429977	4	1	
Q2	XSTR, J-FET, N-CHANNEL	429977	89536	429977	REF		
Q3	XSTR, J-FET, N-CHANNEL	429977	89536	429977	REF		
Q4	XSTR, SI, PNP	195974	04713	2N3906	2	1	
Q5	XSTR, SI, NPN	218396	04713	2N3904	3	1	
Q6	XSTR, J-FET, N-CHANNEL	429969	89536	429969	1	1	
Q7	XSTR, J-FET, N-CHANNEL	429977	89536	429977	REF		
Q8	XSTR, J-FET, DUAL, N-CHANNEL	456483	89536	456483	2	1	1
Q11	XSTR, J-FET, DUAL, N-CHANNEL	456483	89536	456483	REF		
Q13	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q14	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q15	XSTR, SI, PNP	340026	04713	MPS6563	5	1	
Q16	XSTR, SI, PNP	340026	04713	MPS6563	REF		
Q17	XSTR, SI, PNP	340026	04713	MPS6563	REF		
Q18	XSTR, SI, PNP	340026	04713	MPS6563	REF		
Q19	XSTR, SI, PNP	340026	04713	MPS6563	REF		
Q20	XSTR, SI, PNP	418707	04713	MPS6562	1	1	
Q21	XSTR, SI, NPN	218396	04713	2N3904	REF		
R3	RES, VAR, CERMET, 50 +/-10%, 1/2W	285122	71450	360S500A	1	1	
R6	RES, COMP, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	2		
R8	RES, DEP. CAR, 22 +/-5%, 1/4W	381145	80031	CR251-4-5P22E	1		
R9	RES, VAR, CERMET, 500 +/-10%, 1/2W	291120	71450	360S501A	1	1	
R10	RES, VAR, CERMET, 100 +/-10%, 1/2W	285130	71450	360S101A	1	1	
R11	RES, COMP, 9.1 +/-5%, 1/4W	281840	01121	CB91G5	2		
R13	RES, WW, 8.991 +/-0.1%, 3W	441139	89536	441139	1	1	
R14	RES, MTL. FILM, 89.91 +/-0.1%, 1/4W	424283	91637	MFF1_489R91D	1		
R15	RES, MTL. FILM, 899.1 +/-0.1%, 1/4W	424275	91637	MFF1-4899R1D	1		
R16	RES, COMP, 47K +/-5%, 1W	150219	01121	GB4735	2		
R17	RES, COMP, 47K +/-5%, 1W	150219	01121	GB4735	REF		
R18	RES, COMP, 2.2M +/-5%, 1/4W	198390	01121	CB2255	2		
R19	RES, COMP, 1M +/-5%, 1/4W	348987	80031	CR251-4-5P1M	1		
R20	RES, COMP, 8.2K +/-10%, 1/2W	109017	01121	EB8221	1		
R21	RES, COMP, 100K +/-10%, 1/2W	108126	01121	EB1041	1		
R22	RES, DEP. CAR, 220K +/-5%, 1/4W	348953	80031	CR251-4-5P220K	1		
R23	RES, COMP, 2.2M +/-5%, 1/4W	198390	01121	CB2255	REF		
R24	RES, DEP. CAR, 62K +/-5%, 1/4W	348904	80031	CR251-4-5P62K	1		
R25	RES, COMP, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R26	RES, COMP, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10K	3		
R27	RES, MTL. FILM, 1K +/-1%, 1/8W	168229	91637	MFF1-81001F	2		
R28	RES, MTL. FILM, 1K +/-1%, 1/8W	168229	91637	MFF1-81001F	REF		
R29	RES, VAR, CERMET, 5K +/-10%, 1/2W	478883	89536	478883	1		
R36	RES, MTL. FILM, 10K +/-1%, 1/8W	168260	91637	MFF1-81002F	2		

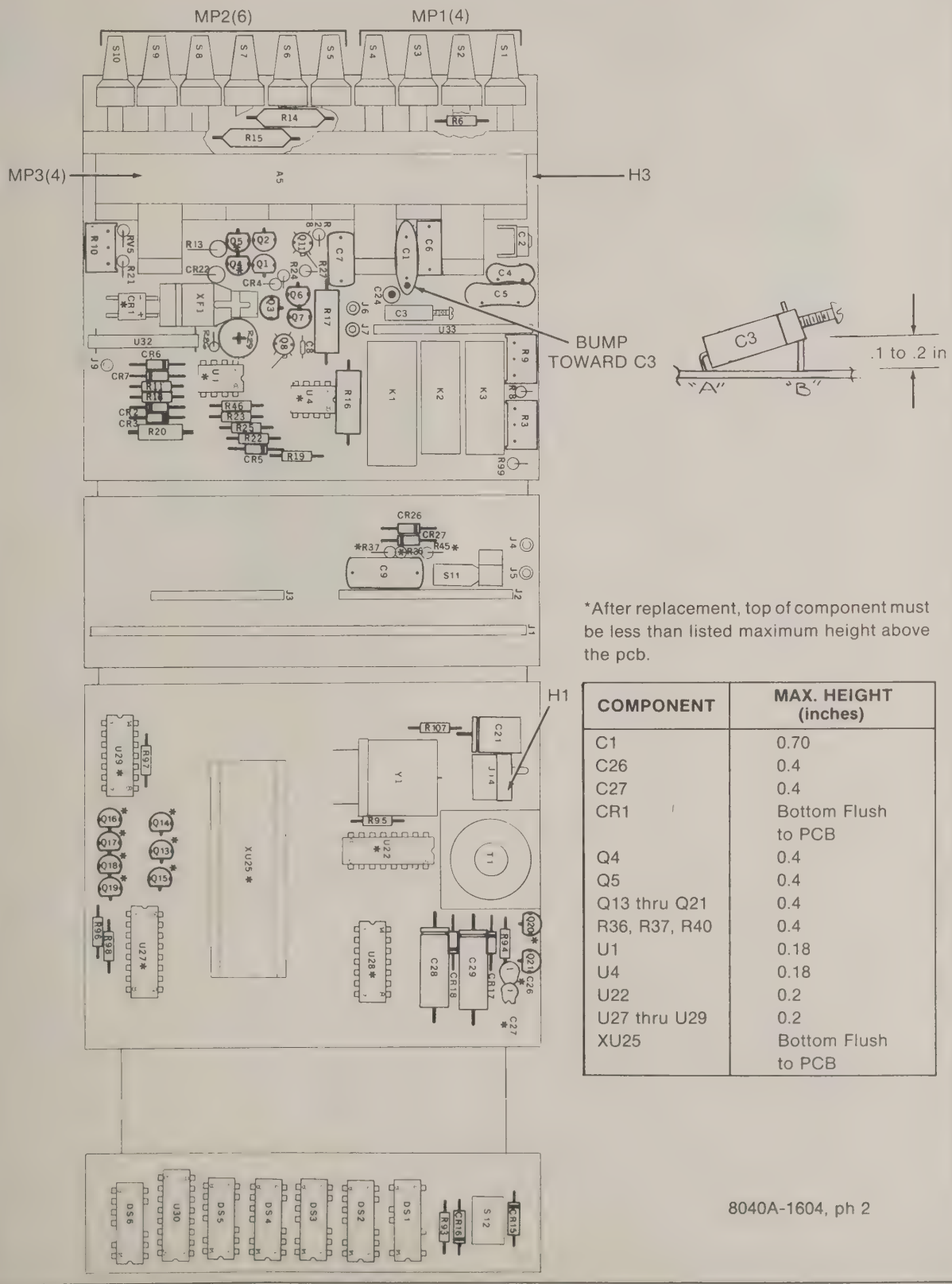
Table 5-2. A1 Main PCB Assembly (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R37	RES, DEP. CAR, 2.2K +/-5%, 1/4W	343400	80031	CR251-4-5P2E2	1		
R45	RES, MTL. FILM, 10K +/-1%, 1/8W	168260	91637	MFF1-81002F	REF		
R46	RES, DEP. CAR, 470K +/-5%, 1/4W	342634	80031	CR251-4-5P470K	1		
R93	RES, DEP. CAR, 22K +/-5%, 1/4W	348870	80031	CR251-4-5P22K	1		
R94	RES, DEP. CAR, 220 +/-5%, 1/4W	342626	80031	CR251-4-5P220E	1		
R95	RES, DEP. CAR, 4.7K +/-5%, 1/4W	348821	80031	CR251-4-5P4K7	1		
R96	RES, COMP, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10K	REF		
R97	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1K	1		
R98	RES, COMP, 820 +/-5%, 1/4W	148015	01121	CB8215	1		
R99	RES, COMP, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10K	REF		
R107	RES, COMP, 9.1 +/-5%, 1/4W	281840	01121	CB91G5	REF		
RV5	RES, VARISTOR	423475	09214	V390MAX781	1		
S1-S10	SWITCH ASSEMBLY	418905	89536	418905	1		
S12	SWITCH, SLIDE	423129	10389	43-901-113	1	1	
T1	TRANSFORMER, INVERTER	423590	89536	423590	1		
U1	IC, LINEAR, OP AMP	418913	12040	LM4250CN	2	1	
U4	IC, LINEAR, OP AMP	418913	12040	LM4250CN	REF		
U22	IC, C-MOS HEX BUFFER/INVERTER (SELECTED)	467530	89536	467530	1		
U25	SEE 8040A FINAL ASSEMBLY (U25)						
U27	IC, TTL, LO-PWR, DECODER/DRIVER	418632	01295	SN74LS47N	1	1	
U28	IC, C-MOS, QUAD, BILATERAL SWITCH	434506	89536	434506	1	1	
U29	IC, LINEAR, NPN, XSTR ARRAY	419002	07263	CA3086N	1	1	
U30	RESISTOR NETWORK, 180 OHM, 16-PIN DIP	424531	89536	424531	1	1	
U32	RESISTOR NETWORK	424325	89536	424325	1	1	
U33	RESISTOR NETWORK, 89.75K OHM, 9.975K OHM	424309	89536	424309	1	1	
XF1	FUSE GUIDE, PLASTIC	438119	89536	438119	1	1	
XF2	FUSE CONTACT, METAL	418491	89536	418491	1	1	
XU25	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	1		
Y1	CRYSTAL, 1.000 MHZ	423418	89536	423418	1	1	

FOR REV B OR REV C MAIN PCB ASSEMBLIES:

1) Q11 LEG SHOULD BE SOLDERED TO THE RIGHT LEG OF R27.

2) Q8 SHOULD BE A NEW COMPONENT.



*After replacement, top of component must be less than listed maximum height above the pcb.

COMPONENT	MAX. HEIGHT (inches)
C1	0.70
C26	0.4
C27	0.4
CR1	Bottom Flush to PCB
Q4	0.4
Q5	0.4
Q13 thru Q21	0.4
R36, R37, R40	0.4
U1	0.18
U4	0.18
U22	0.2
U27 thru U29	0.2
XU25	Bottom Flush to PCB

8040A-1604, ph 2

Figure 5-2. A1 Main PCB Assembly

Table 5-3. A2 Digital Conditioner PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	Ⓐ DIGITAL CONDITIONER PCB ASSEMBLY FIGURE 5-3 (8040A-4002)	ORDER	ONLY	REPLACEABLE PARTS			
CR19	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	3	1	
CR20	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR21	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
H1	BUMPER, MOLDED (REAR) (NOT SHOWN)	441733	89536	441733	1		
H2	INSULATOR, XFMR (NOT SHOWN)	456475	89536	456475	1		
P1	CONNECTOR, POST	424655	89536	424655	40		
U15	Ⓐ IC, C-MOS, HEX, INVERTER	404681	95303	CD4069BE	2	1	
U16	Ⓐ IC, C-MOS, QUAD, 2-INPUT, OR GATE	408393	95303	CD4071BE	1	1	
U17	Ⓐ IC, C-MOS, QUAD, 2-INPUT, NOR GATES	355172	95303	CD4001AE	2	1	
U18	Ⓐ IC, C-MOS, QUAD, AND-OR, SELECT GATE	419010	95303	CD4019AE	1	1	
U19	Ⓐ IC, C-MOS, QUAD, 2-INPUT, AND GATE	408401	95303	CD4081BE	1	1	
U20	Ⓐ IC, C-MOS, HEX, OPEN DRAIN, BUFFERS	418947	12040	MM74C907N	1	1	
U21	Ⓐ IC, COS/MOS HEX, BUFFER/INVERTERS	381848	95303	CD4049A	1	1	
U23	Ⓐ IC, C-MOS, QUAD, 2-INPUT, NOR GATES	355172	95303	CD4001AE	REF		
U24	Ⓐ IC, C-MOS, QUAD, BILATERAL SWITCH	434506	95303	CD4016AE	1	1	
U26	Ⓐ IC, C-MOS, HEX, INVERTER	404681	95303	CD4069BE	REF		
U35	RESISTOR NETWORK	412908	89536	412908	1	1	
U36	RESISTOR NETWORK	435594	89536	435594	1	1	

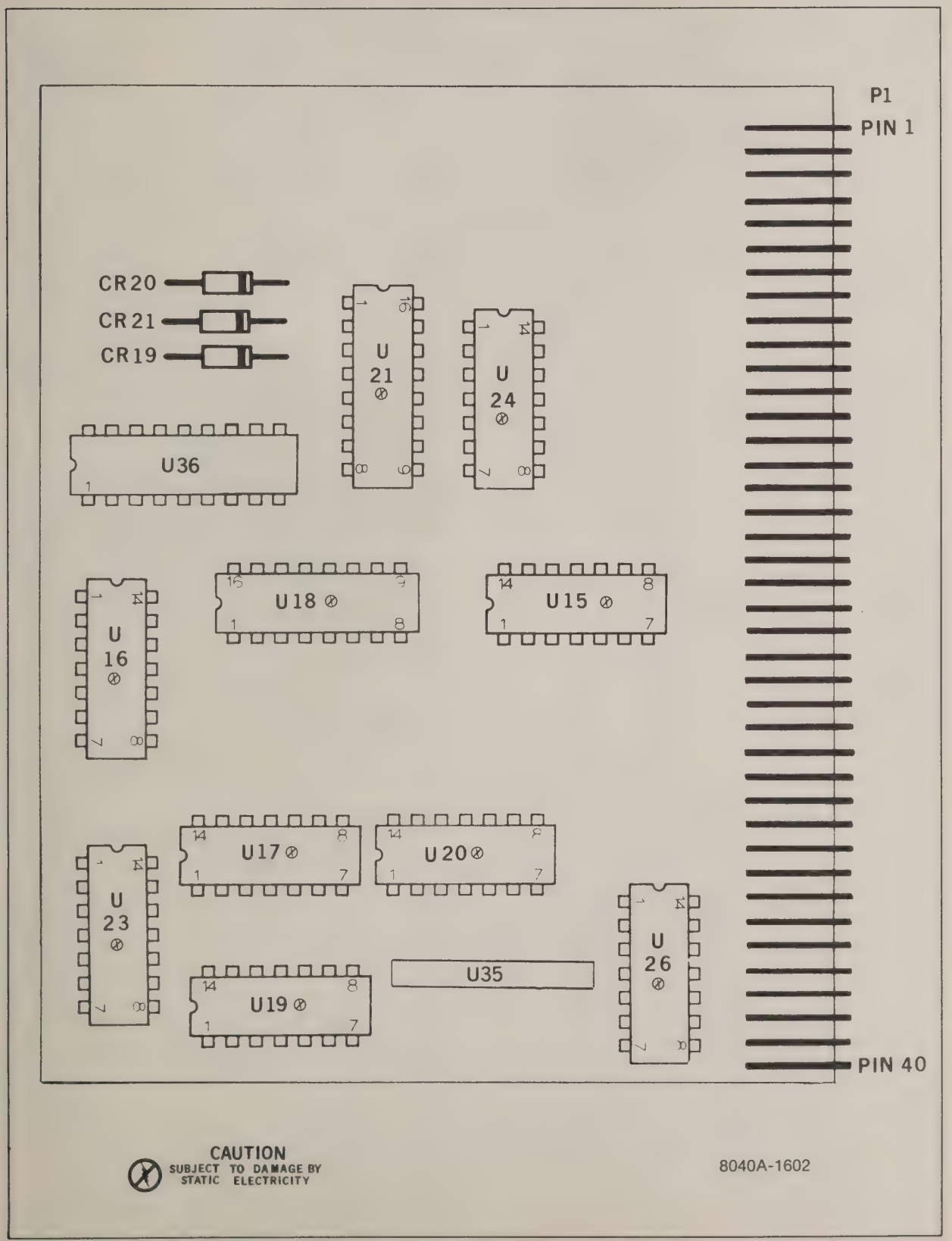


Figure 5-3. A2 Digital Conditioner PCB Assembly

Table 5-4. A3 Analog Converter PCB Assembly

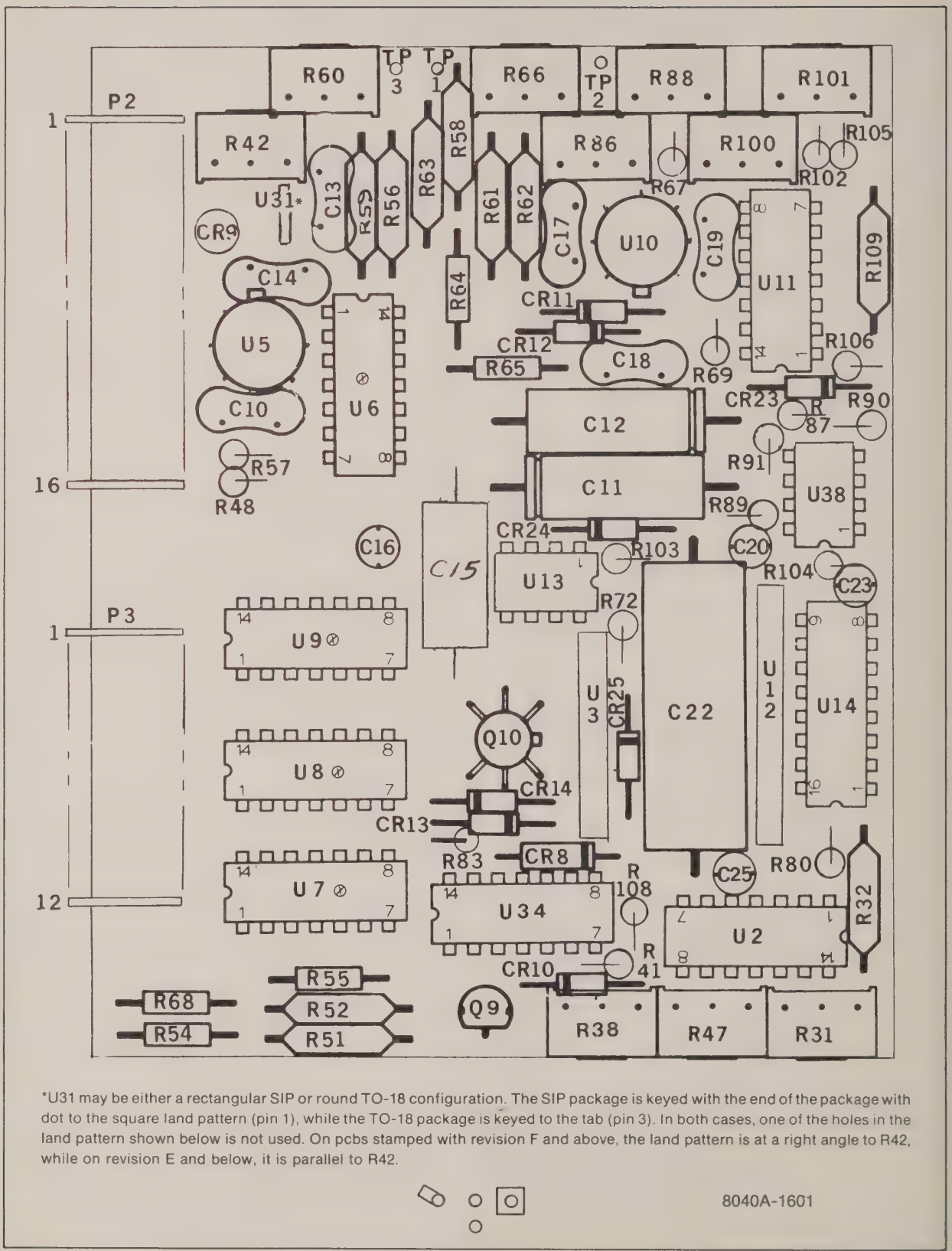
ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A3	Ⓐ ANALOG CONVERTER PCB ASSEMBLY FIGURE 5-4 (8040A-4001)	ORDER	ONLY	REPLACEABLE PARTS			
C10	CAP, MICA, 22 PF +/-5%, 500V	148551	72136	DM15C220J	2		
C11	CAP, ELECT, 47 UF -10/+50%, 25V	168823	73445	ET470X025A4	2		
C12	CAP, ELECT, 47 UF -10/+50%, 25V	168823	73445	ET470X025A4	REF		
C13	CAP, MICA, 270 PF +/-5%, 500V	148452	72136	DM15F271J	1		
C14	CAP, MICA, 22 PF +/-5%, 500V	148551	72136	DM15C220J	REF		
C15	CAP, POLYCARBONATE, 0.47 UF +/-10%, 100V	288860	01281	X4630W47491W	1		
C16	CAP, TA, 1 UF +/-20%, 35V	161919	56289	196D105X0035	1		
C17	CAP, MICA, 150 PF +/-5%, 500V	148478	72136	DM15F151J	1		
C18	CAP, MICA, 5 PF +/-10%, 500V	148577	72136	DM15C050K	2		
C19	CAP, MICA, 5 PF +/-10%, 500V	148577	72136	DM15C050K	REF		
C20	CAP, TA, 2.2 UF +/-10%, 15V	364216	56289	196D225X9015HA1	1		
C22	CAP, POLYPROPYLENE, 0.47 UF +/-10%, 50V	363085	89536	363085	1		
C23	CAP, TA, 0.47 UF +/-20%, 35V	161349	56289	196D474X0035HA1	1		
C25	CAP, TA, 0.22 UF +/-20%, 35V	161331	56289	196D224X0035HA1	1		
CR8	MATCHED SET ASSY (CR8, R32, U34)						1
CR9	DIODE, FET	393454	07910	TCR5290	1	1	
CR10	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	6	2	
CR11	DIODE, SI, LO-CAP, LO-LEAK	375907	07263	FD7222	2	1	
CR12	DIODE, SI, LO-CAP, LO-LEAK	375907	07263	FD7222	REF		
CR13	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR14	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR23	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR24	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
CR25	DIODE, HI-SPEED SWITCHING	203323	07910	1N4448	REF		
MP1	SPACER, XSTR, MTG (NOT SHOWN)	175125	07047	10172-DAP	1		
P2	CONNECTOR, POST	424653	89536	424653	28		
P3	CONNECTOR, POST	424653	89536	424653	REF		
Q9	XSTR, SI, NPN	218396	04713	2N3904	1	1	
Q10	XSTR, DUAL FET, N-CHANNEL	419283	89536	419283	1	1	
R31	RES, VAR, CERMET, 50 +/-10%, 1/2W	285122	71450	360S500A	1	1	
R32	RESISTOR (PART OF CR8 SET)						1
R38	RES, VAR, CERMET, 100 +/-10%, 1/2W	285130	71450	360S101A	2	1	
R41	RES, COMP, 47K +/-5%, 1/4W	148163	01121	CB4735	2		
R42	RES, VAR, CERMET, 100 +/-10%, 1/2W	285130	71450	360S101A	REF		
R47	RES, VAR, CERMET, 20K +/-10%, 1/2W	291609	71450	360S203A	1	1	
R48	RES, COMP, 10 +/-5%, 1/4W	147868	01121	CB1005	2		
R51	RES, MTL. FILM, 100K +/-1%, 1/8W	248807	91637	MFF1-81003F	1		
R52	RES, MTL. FILM, 100 +/-1%, 1/8W	168195	91637	MFF1-8A100F	1		
R54	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	2		
R55	RES, DEP. CAR, 100 +/5%, 1/4W	348771	80031	CR251-4-5P100	1		
R56	RES, MTL. FILM, 2.67K +/-1%, 1/8W	289587	91637	MFF1-82671F	1		
R57	RES, COMP, 10 +/-5%, 1/4W	147868	01121	CB1005	REF		
R58	RES, MTL. FILM, 20.0K +/-0.25%, 1/8W	442970	91637	MFF1-82002C	3		
R59	RES, MTL. FILM, 130K +/-1%, 1/8W	221648	91637	MFF1-81303F	1		
R60	RES, VAR, CERMET, 100K +/-10%, 1/2W	288308	71450	360S104A	4	1	
R61	RES, MTL. FILM, 20.0K +/-0.25%, 1/8W	442970	91637	MFF1-82002C	REF		
R62	RES, MTL. FILM, 9.90K +/-0.25%, 1/8W	446419	91637	MFF1-89901C	1		
R63	RES, MTL. FILM, 20.0K +/-0.25%, 1/8W	442970	91637	MFF1-82002C	REF		

Table 5-4. A3 Analog Converter PCB Assembly (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R64	RES, DEP. CAR, 20K +/-5%, 1/4W	441477	80031	CR251-4-5P20K	1		
R65	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10K	1		
R66	RES, VAR, CERMET, 100K +/-10%, 1/2W	288308	71450	360S104A	REF		
R67	RES, COMP, 4.7M +/-5%, 1/4W	220046	01121	CB4755	4		
R68	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100K	REF		
R69	RES, COMP, 3.3K +/-5%, 1/4W	148056	01121	CB3325	2		
R72	RES, COMP, 270K +/-5%, 1/4W	220061	01121	CB2745	1		
R80	RES, COMP, 62 +/-5%, 1/4W	261842	01121	CB6205	1		
R83	RES, COMP, 4.7M +/-5%, 1/4W	220046	01121	CB4755	REF		
R86	RES, VAR, CERMET, 200 +/-10%, 1/2W	285148	71450	360S2201A	1	1	
R87	RES, COMP, 4.7M +/-5%, 1/4W	220046	01121	CB4755	REF		
R88	RES, VAR, CERMET, 100K +/-10%, 1/2W	288308	71450	360S104A	REF		
R89	RES, COMP, 470K +/-5%, 1/4W	188441	01121	CB4745	1		
R90	RES, COMP, 6.8K +/-5%, 1/4W	148098	01121	CB6825	1		
R91	RES, COMP, 3.3K +/-5%, 1/4W	148056	01121	CB3325	REF		
R100	RES, VAR, CERMET, 100K +/-10%, 1/2W	288308	71450	360S104A	REF		
R101	RES, VAR, CERMET, 2K +/-10%, 1/2W	285163	71450	360S202A	1	1	
R102	RES, COMP, 4.7M +/-5%, 1/4W	220046	01121	CB4755	REF		
R103	RES, COMP, 15K +/-5%, 1/4W	148114	01121	CB1535	1		
R104	RES, COMP, 47K +/-5%, 1/4W	148163	01121	CB4735	REF		
R105	RES, MTL. FILM, 35.7K +/-0.25%, 1/8W	446427	91637	MFF1-83572C	1		
R106	RES, MTL. FILM, 10.0K +/-0.25%, 1/8W	446435	91637	MFF1-81002C	1		
R108	RES, COMP, 1.3K +/-5%, 1/4W	234252	01121	CB1325	1		
R109	SELECTED IC RESISTOR ASSY (U11, R109)	456434	89536	456434	1	1	2
U2	IC, LINEAR, OP AMP, QUAD	402669	12040	LM324N	1	1	
U3	RESISTOR NETWORK	442814	89536	442814	1	1	
U5	IC, LINEAR, OP AMP	352930	89536	352930	2	1	
U6	⊘IC, C-MOS, QUAD, BILATERIAL SWITCH	408062	95303	CD4066AE	2	1	
U7	⊘IC, C-MOS, QUAD, BILATERIAL SWITCH	408062	95303	CD4066AE	REF		
U8	⊘IC, C-MOS, QUAD, BILATERIAL SWITCH	428466	89536	428466	2	1	
U9	⊘IC, C-MOS, QUAD, BILATERIAL SWITCH	428466	89536	428466	REF		
U10	IC, LINEAR, OP AMP	352930	89536	352930	REF		
U11	PART OF R109 SET						2
U12	IC, RESISTOR NETWORK	442806	89536	442806	1	1	
U13	IC, LINEAR, OP AMP, DUAL, SELECTED	418566	89536	418566	1	1	
U14	IC, LINEAR, 5-XSTR ARRAY	418954	95303	CA3096E	1	1	
U31	RESISTOR NETWORK, 2 RESISTORS	424341	89536	424341	1	1	
U34	MATCHED SET ASSEMBLY (PART OF CR8 SET)						1
U38	IC, LINEAR, OP AMP, PROGRAMMABLE	418913	12040	LM4250CN	1	1	

1 MATCHED SET ASSY (CR8, R32, U34). SEE 8040A FINAL ASSY. AT R32 FOR PROCURABLE PART NO.

2 SELECTED IC RESISTOR ASSY, U11 AND R109. WHEN U11 IS REPLACED, R109 MAY HAVE TO BE REPLACED ALSO. SEE 8040A FINAL ASSY FOR PROCURABLE PART NO. SEE AC CONVERTER CALIBRATION FOR SELECTION OF R109.



*U31 may be either a rectangular SIP or round TO-18 configuration. The SIP package is keyed with the end of the package with dot to the square land pattern (pin 1), while the TO-18 package is keyed to the tab (pin 3). In both cases, one of the holes in the land pattern shown below is not used. On pcbs stamped with revision F and above, the land pattern is at a right angle to R42, while on revision E and below, it is parallel to R42.

8040A-1601

Figure 5-4. A3 Analog Converter PCB Assembly

Table 5-4. A4 Volt-Ohm Input PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A4	VOLT-OHM INPUT PCB ASSEMBLY FIGURE 5-5 (8040A-4003)	ORDER	ONLY	REPLACEABLE PARTS			
C30	CAP, CER, 47 PF +/-10%, 2KV/3.5 KV	282145	00656	HVD347K2KV1	1		
H1	SPACER, DIS-O-PAD	296319	32559	TO-8-06	2		
J11	JACK, INPUT	492314	89536	492314	2		
J12	JACK, INPUT	492314	89536	492314	REF		
P6	PIN, PCB MTG.	428235	89536	428235	3		
P7	PIN, PCB MTG.	428235	89536	428235	REF		
P9	PIN, PCB MTG.	428235	89536	428235	REF		
R1	RES, COMP, 100K +/-10%, 1/2W	108126	01121	EB1041	1		
R2	RES, HI-VOLTAGE, 9.95K +/-0.25%, 4W	424317	89536	424317	1		
RV1	RES, VARISTOR	423475	09214	V390MAX781	5	1	
RV2	RES, VARISTOR	423475	09214	V390MAX781	REF		
RV3	RES, VARISTOR	423475	09214	V390MAX781	REF		
RV4	RES, VARISTOR	423475	09214	V390MAX781	REF		
RV6	RES, VARISTOR	423475	09214	V390MAX781	REF		

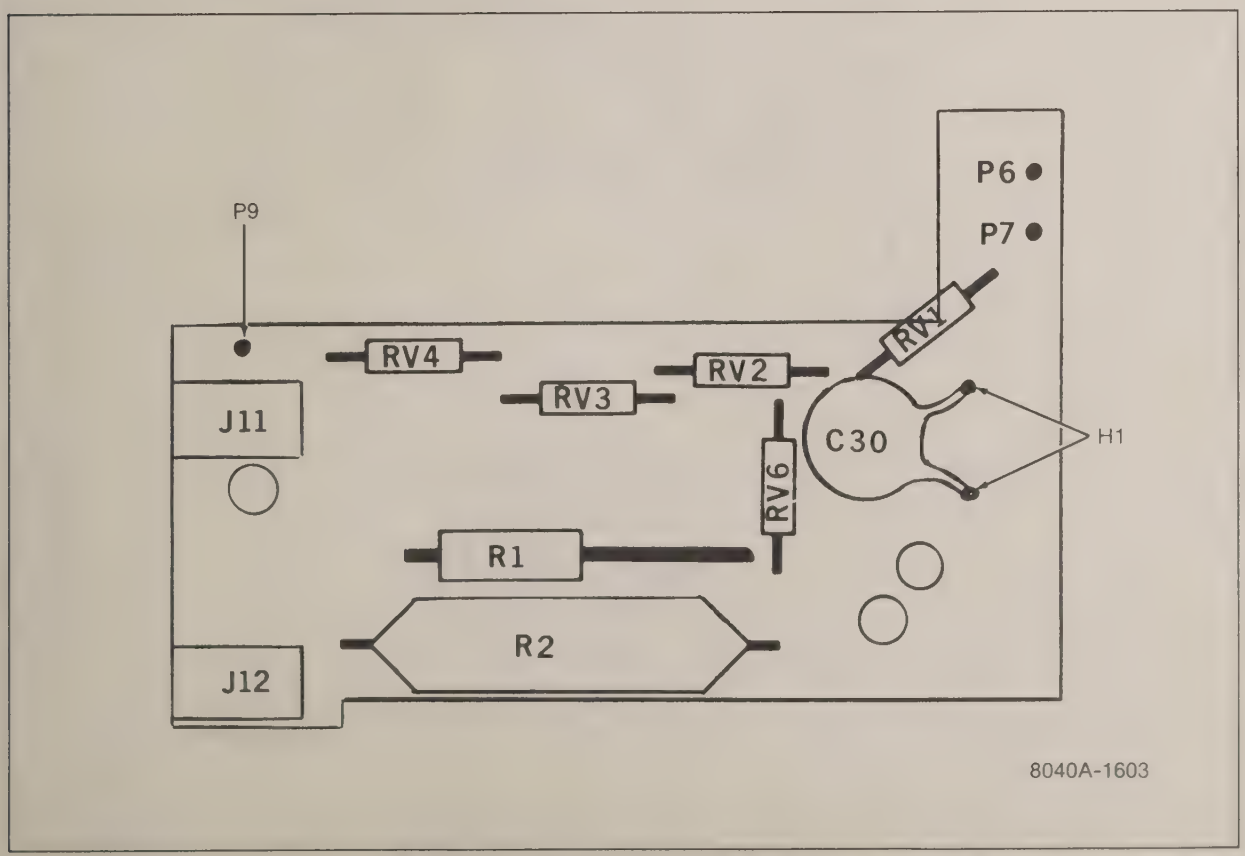


Figure 5-5. A4 Volt-Ohm Input PCB Assembly

Table 5-6. A6 Case Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A6	CASE ASSEMBLY FIGURE 5-6 (8040A-4202)	426601	89536	426601	REF		
F2	FUSE, 3 AMP, AXIAL LEADS	460915	71400	GFA-3A	1	5	
H1	WASHER, RETAINING	440313	89536	440313	1		
H2	SCREW, FH, 8-32 X 1/4	320101	89536	320101	1		
MP1	CASE, (8040A-4203)	426635	89536	426635	1		
MP2	SUNSHADE	418673	89536	418673	1		
MP3	BAIL	418855	89536	418855	1		
MP4	CONTACT	423128	89536	423128	4		
MP5	RETAINER	426357	89536	426357	1		
MP6	DECAL SET	419291	89536	419291	1		

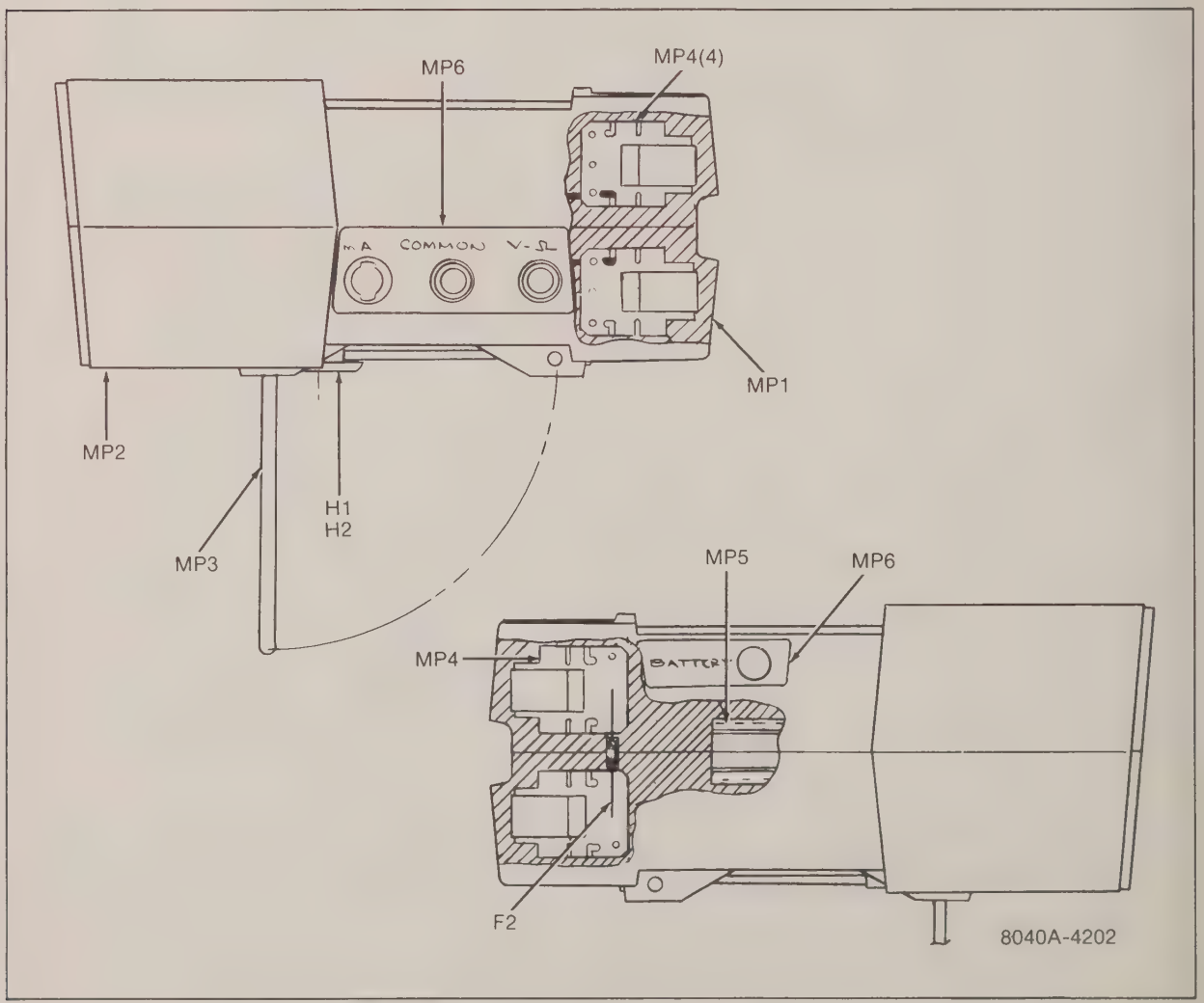


Figure 5-6. A6 Case Assembly

Table 5-7. A7 Battery Pack Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A7	BATTERY PACK ASSEMBLY (STANDARD UNIT) FIGURE 5-7 (8040A-7004K)	430959	89536	430959	REF		
BT1	BATTERY, ALKALINE	423582	89536	423582	4		
BT2	BATTERY, ALKALINE	423582	89536	423582	REF		
BT3	BATTERY, ALKALINE	423582	89536	423582	REF		
BT4	BATTERY, ALKALINE	423582	89536	423582	REF		
H1	SCREW, FH, 4-40 X 1/4	276709	89536	276709	2		
MP1	COVER, BATTERY PACK	418863	89536	418863	1		
MP2	SHOCK ABSORBERS, 6-32 X 1/4	428441	89536	428441	4		
MP3	DECAL	419325	89536	419325	1		

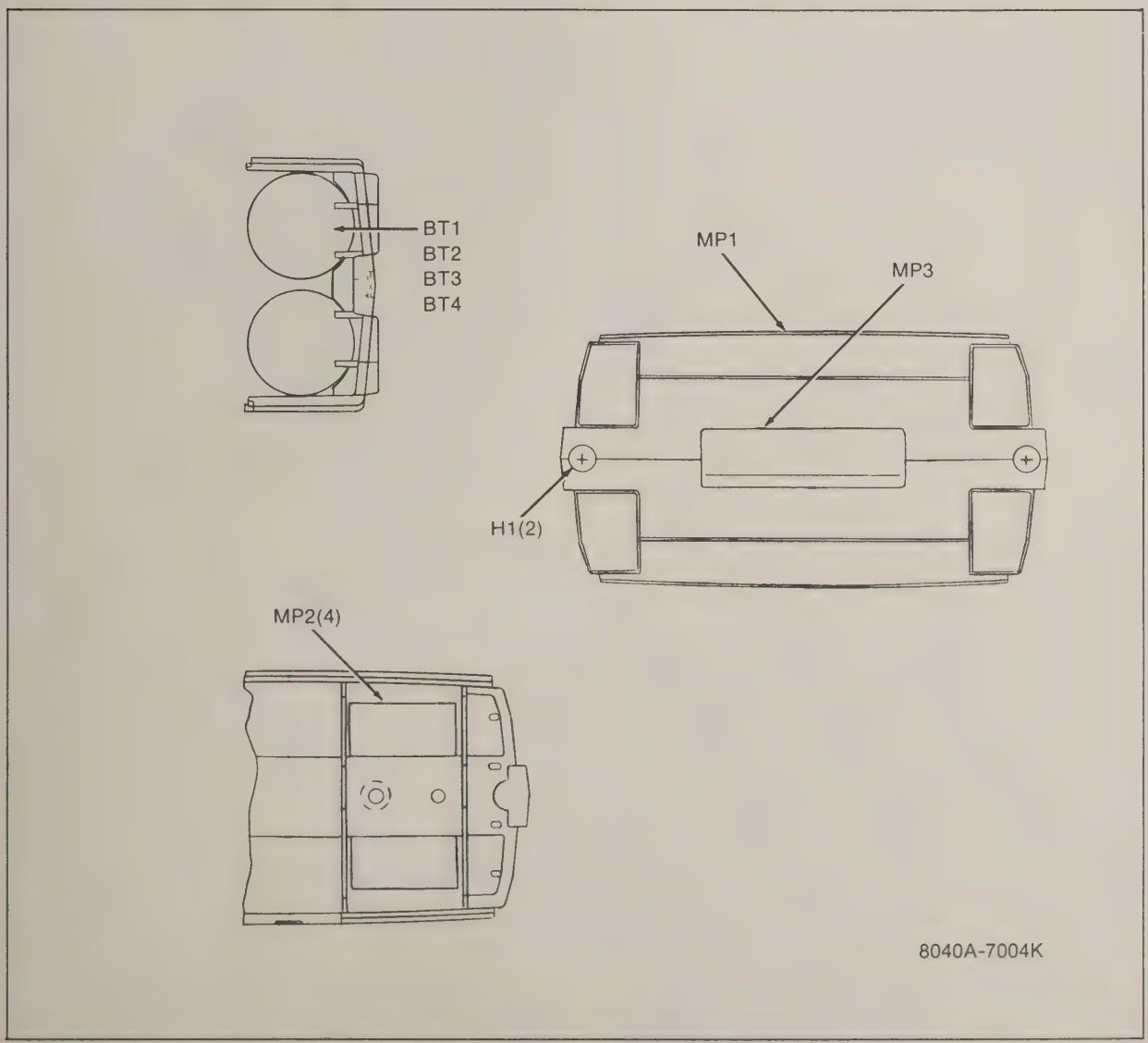


Figure 5-7. A7 Battery Pack Assembly

Section 6
Option & Accessory Information

TABLE OF CONTENTS

OPTION/ MODEL NO.	DESCRIPTION	PAGE
	ACCESSORIES	
8040A-7005K	Spare Ni-cad Battery Pack Kit	600-1
8040A-7007K	Battery Cover Kit	600-1
C88	Carrying Case	600-1
A81	Battery Charger/Eliminator	600-1
80T-150	Temperature Probe	600-1
A80	Deluxe Test Lead Kit	600-3
80F-5	High Voltage Probe	600-3
80F-15	High Voltage Probe	600-4
80K-40	High Voltage Probe	600-4
801-600	Current Transformer	600-5
80J-10	Current Shunt	600-6
81RF	RF Probe	600-6
82RF	RF Probe	600-6
	OPTIONS	
-01	8040A with Rechargeable Battery and Line Operation	601-1
-03	8040A with Disposable Battery, No Line Operation	603-1

6-1. INTRODUCTION

6-2. This section of the manual contains information concerning the options and accessories available for use with the Model 8040A. It consists of an introductory section, including a table of contents, an accessories subsection, and a series of option subsections. All options and accessories are listed by model or option number in the table of contents. Corresponding subsection page numbers and other documentation location information are also listed.

6-3. The location of a particular subsection is facilitated by the use of unique page and paragraph numbering which corresponds to the option or accessory in question. For example, a 600-X series identifies the general accessory subsection and a 603-X series identifies the subsection for the -03 Option (where X is the sequential paragraph number).

Accessories

600-1. SPARE NI-CAD BATTERY PACK KIT

600-2. The Spare Ni-cad Battery Pack Kit, item 1 in Figure 600-1, is a duplicate of the rechargeable battery pack assembly used in the 8040A-01. Order 8040A-7005K for a spare rechargeable battery pack assembly. For any other information, see the -01 Option information.

600-3. BATTERY COVER KIT

600-4. The Battery Cover Kit is a replacement for the disposable battery pack assembly. The disposable batteries are not included. Order 8040A-7007K for a Battery Cover Kit.

600-5. CARRYING CASE (C88)

600-6. The Model C88 Carrying Case, item 2 in Figure 600-1, is a soft vinyl container designed to provide protection for the 8040A Multimeter as well as increased convenience during portable operation. A detachable storage pouch provides room for test leads, spare batteries, the operator's manual, and small accessories.

600-7. BATTERY CHARGER/ELIMINATOR (A81)

600-8. The Battery Charger/Eliminator, item 3 in Figure 600-1, may be ordered in one of four input power configurations. Each power configuration has a unique model number which must be used when ordering this accessory. Refer to Table 600-1 for the description of each model number.

WARNING

DO NOT SUBSTITUTE A CALCULATOR TYPE BATTERY ELIMINATOR FOR THE A81. THESE UNITS DO NOT PROVIDE THE PROTECTION NECESSARY FOR COMMON MODE MEASUREMENTS UP TO 500V DC. ALWAYS USE THE MODEL A81 FOR AC LINE OPERATION.

600-9. TEMPERATURE PROBE (80T-150)

600-10. Introduction

600-11. The 80T-150 Temperature Probe (Figure 600-1) converts the 8040A into a direct-reading (1 mV dc/°) °C or °F thermometer. It is ideally suited for surface, ambient, liquid measurements, and lends itself easily to a wide range of design troubleshooting and evaluation applications. A rugged, fast-responding probe-tip with a 350V dc standoff makes the 80T-150 one of the most versatile and easy-to-use temperature probes available.

600-12. Specifications

Range (°C/°F field selectable by internal jumpers): -50°C to +150°C or -58°F to +302°F.

Accuracy: ±1°C (1.8°F) from 0°C to 100°C, decreasing linearity to ±3°C (5.4°F) at -50°C and +150°C.

Resolution: 0.1°C on 200 mV range.

Voltage Standoff: 350V dc or peak ac.

Power: Internal disposable battery; 1.000 hours of continuous use.

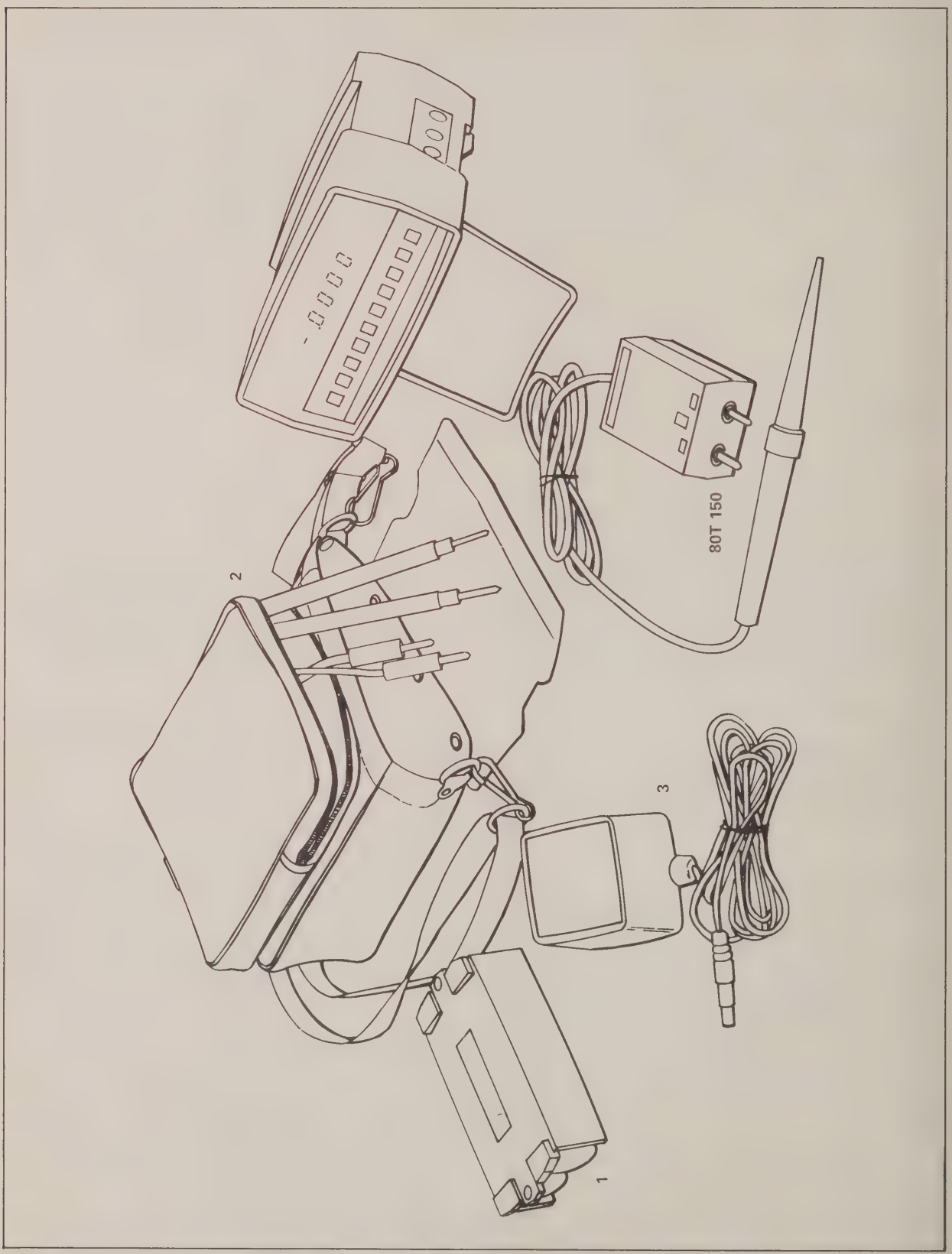


Figure 600-1. 8040A Accessories

Table 600-1. Battery Charger/Eliminator Input Power Configurations

MODEL NO.	INPUT POWER
A81-100	100V ac, 50 to 60 Hz
A81-115	115V ac, 50 to 60 Hz
A81-230-1	230V ac, 50 to 60 Hz (U.S. type plug)
A81-230	230V ac, 50 to 60 Hz (European type plug)

600-13. DELUXE TEST LEAD KIT (A80)

600-14. The Deluxe Test Lead Kit, shown in Figure 600-2, contains two test leads with probes (red and black) and five pairs of universal probe tips. The probe tips include: alligator clips, test probe tips, pin tips, banana plug tips, and binding post lugs. A convenient plastic pouch is provided for storing the contents of the test lead kit.

600-15. HIGH VOLTAGE PROBE (80F-5)

600-16. Introduction

600-17. The Model 80F-5, shown in Figure 600-3, extends the voltage measurement capability of the 8040A up to 5 kV. Internally, the probe contains a special 100:1 resistive divider. Metal-film resistor with matched temperature coefficients comprise the divider, and provide the probe with its excellent accuracy and stability characteristics. Also, a high input impedance (50 MΩ) minimizes circuit loading, and thereby contributes to measurement accuracy.

600-18. Specifications

Input Voltage Range: 500 - 5000V.
Input Resistance: 50 MΩ.
Division Ratio: 1000:1.
Ratio Accuracy: (23°C ±1°C) (into 10 MΩ ±0.1% voltmeter input), ±0.05% of input.
Stability of Ratio: ±0.01%/month; 0.05% year (recalibrated by internal adjustment).
Operating Temperature: 0°C to +50°C.

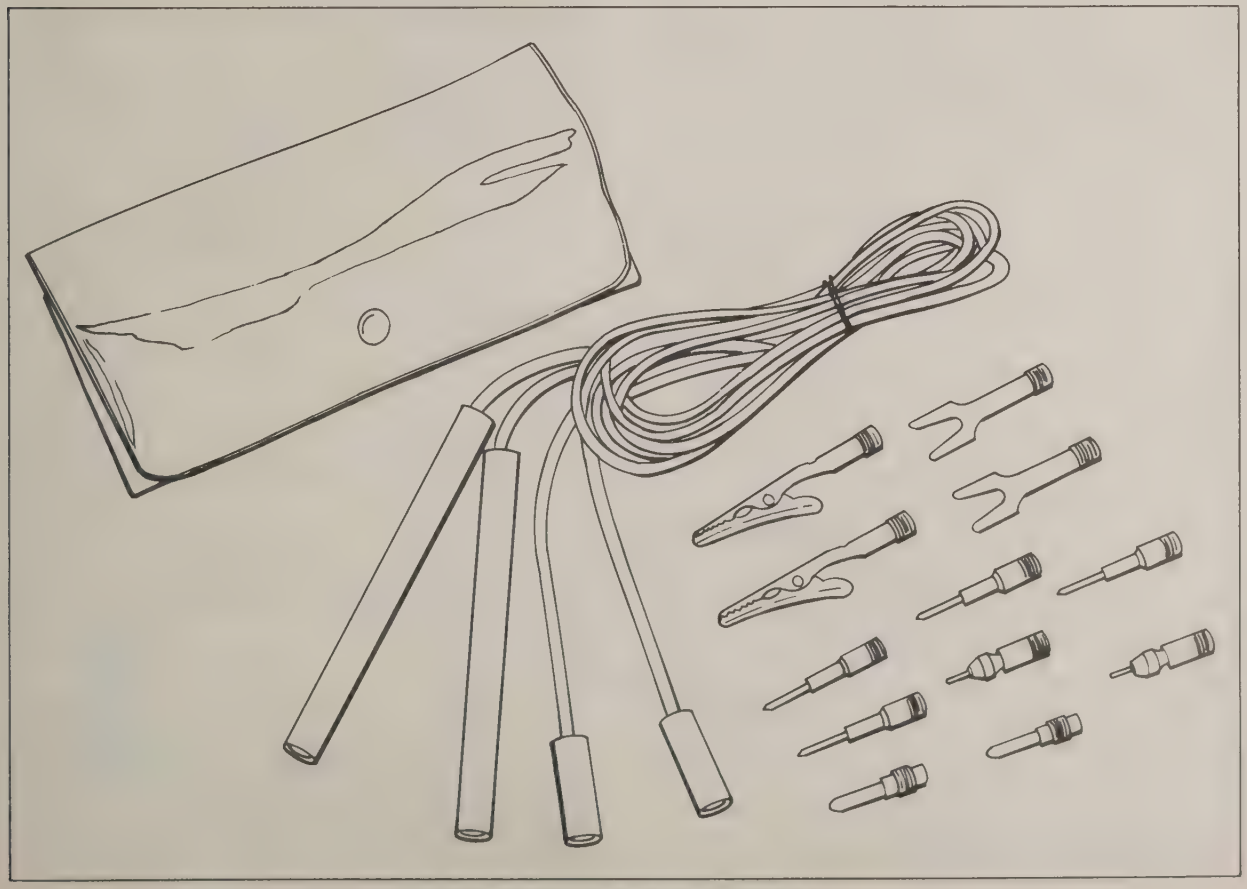


Figure 600-2. Deluxe Test Lead Kit

Temperature Coefficient: 0.001%/°C.
Humidity Range: 0 to 80% relative humidity.
Options:
-01: Calibrated for output into 11 MΩ ±0.1%.
-02: Calibrated for output into $>10^{10}\Omega$.

600-19. HIGH VOLTAGE PROBE (80F-15)

600-20. Introduction

600-21. The Model 80F-15, shown in Figure 600-4, extends the voltage measurement capability of the 8040A up to 15 kV. Internally, the probe contains a special 1000:1 resistive divider. Metal-film resistor with matched temperature coefficients comprise the divider, and provide the probe with its excellent accuracy and stability characteristics. Also, a high input impedance (100 MΩ) minimized circuit loading, and thereby, contributes to measurement accuracy.

600-22. Specifications

Input Voltage Range: 1000 - 15,000V.
Input Resistance: 100 MΩ.
Division Ratio: 1000:1.
Ratio Accuracy: (23°C ±1°) (into 10 MΩ ±0.1% voltmeter input), ±0.05 of input.
Stability of Ratio: ±0.01%/month; 0.05%/year (recalibrated by internal adjustment).
Operating Temperature: 0°C to +50°C.
Temperature Coefficient: 0.001%/°C.
Humidity Range: 0 to 80% relative humidity.
Options:
-01: Calibrated for output into 11 MΩ ±0.1%.
-02: Calibrated for output into $>10^{10}\Omega$.

600-23. HIGH VOLTAGE PROBE (80K-40)

600-24. Introduction

600-25. The Model 80K-40, shown in Figure 600-5, extends the voltage measurement capability of the 8040A up to 40 kV. Internally, the probe contains a special 1000:1 resistive divider. Metal-film resistor with matched temperature coefficients comprise the divider, and provide the probe with its excellent accuracy and stability characteristics. Also, an unusually high input impedance (1000 MΩ) minimizes circuit loading, and thereby contributes to measurement accuracy.

600-26. Specifications

Voltage Range: 1 kV to 40 kV dc or peak ac, 28 kV rms ac.
Input Resistance: 1000 MΩ.
Division Ratio: 1000:1.
Accuracy DC
Overall Accuracy: 20 kV to 30 kV ±2% (calibrated at 25 kV).
Upper Limit: Changes linearly from 2% at 30 kV to 4% at 1 kV.
Lower Limit: Changes linearly from 2% at 20 kV to 4% at 1 kV.
Accuracy AC (Overall): ±5% at 60 Hz.

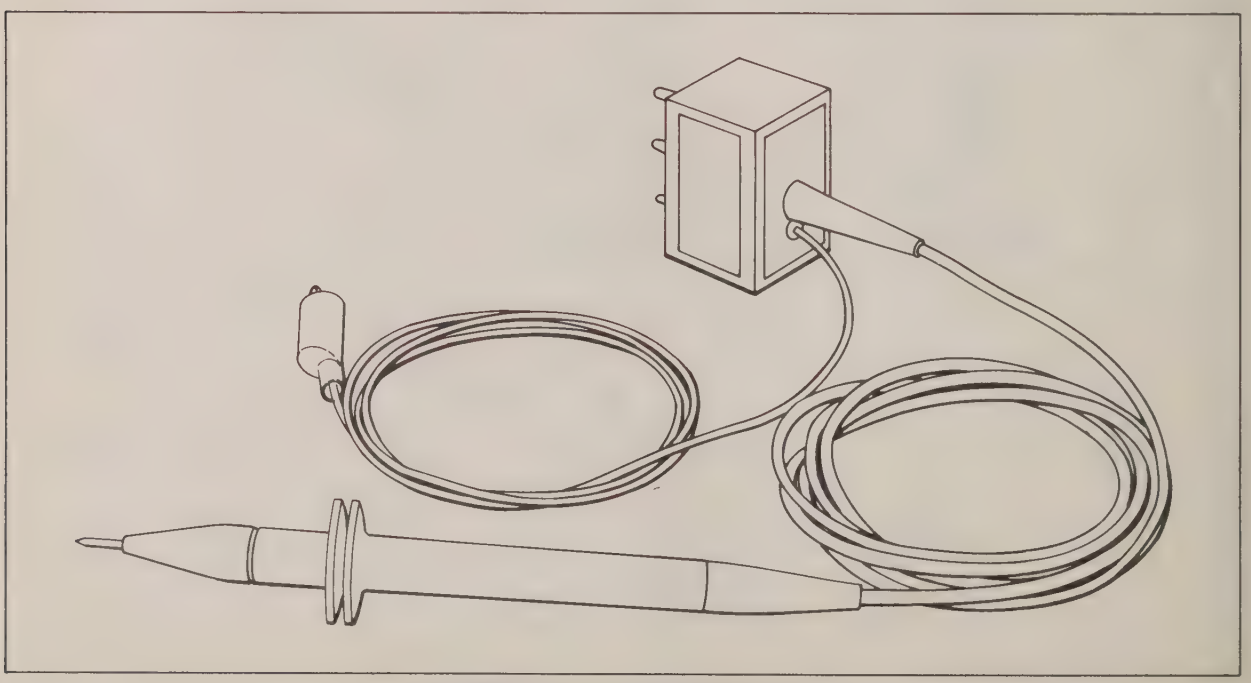


Figure 600-3. 80F-15 High Voltage Probe

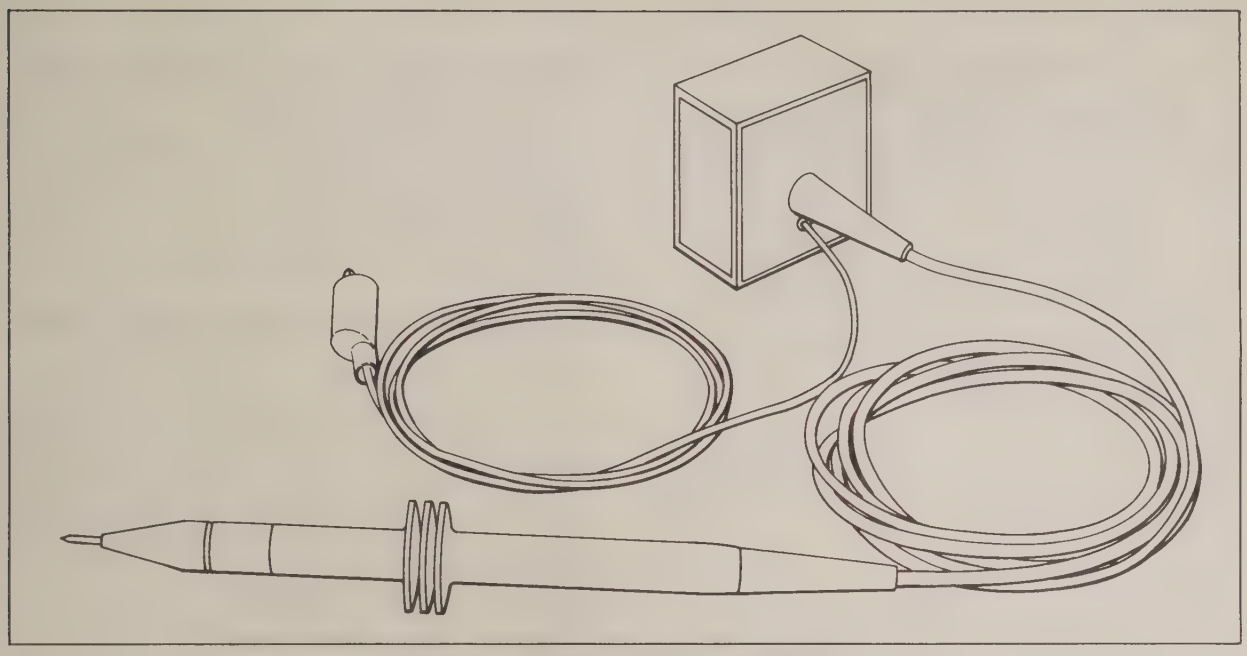


Figure 600-4. 80F-15 High Voltage Probe

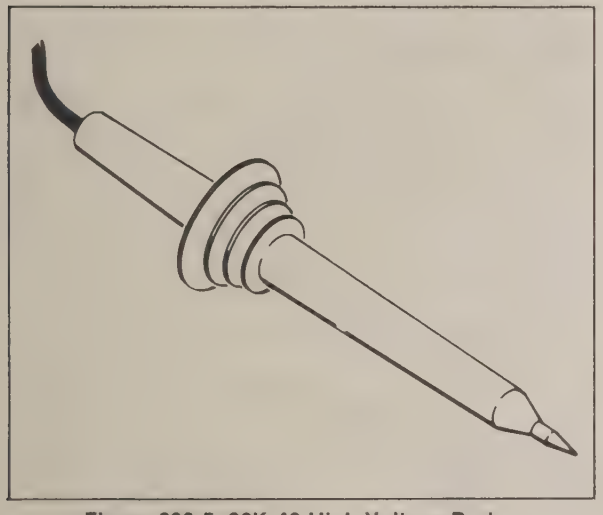


Figure 600-5. 80K-40 High Voltage Probe

600-27. CURRENT TRANSFORMER (80I-600)

600-28. Introduction

600-29. The Model 80I-600, shown in Figure 600-6, extends the maximum 2A ac current measuring capability of the 8040A up to a maximum of 600 amps. A clamp-on transformer designed into the probe allows measurements to be made without breaking the circuit under test. In use, the current carrying conductor being measured serves as the transformer's primary while the 80I-600 serves as the secondary. Because of a high efficiency, quadrature type of winding, wire size and location of the conductor within the transformer jaws do not affect accuracy of the current measurement.

600-30. Specifications

Range: See Table 600-2.
Accuracy: ±3%.
Frequency Response: 30 Hz to 1 kHz.
Division Ratio: 1000:1.
Insulation: 5 kV.
Maximum Conductor Size: 2-inch diameter.

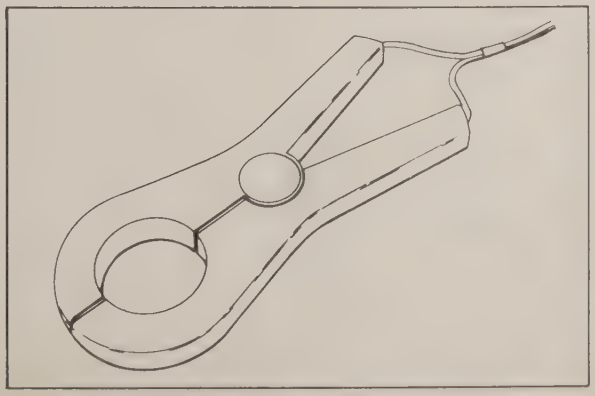


Figure 600-6. 80I-600 Current Transformer

Table 600-2. 8040A Ranges for Current Transformer (80I-600)

8040A RANGE SELECTED	8040A CURRENT RANGE WITH 80I-600 TRANSFORMER
2000	200A to 600A
200	20A to 200A
20	2A to 20A

600-31. CURRENT SHUNT (80J-10)

600-32. Introduction

600-33. The Model 80J-10 extends the current measurement range of the 8040A. Up to 10 amps may be measured continuously using the 80J-10. Up to 20 amps may be measured for up to one minute.

600-34. Specifications

Output: 100 mV at 10A.
Accuracy: (18°C to 28°C) ±0.25% from dc to 10 kHz. Typically rises to +1 dB at 100 kHz.

600-35. HIGH FREQUENCY PROBE (81RF)

600-36. Introduction

600-37. The 81RF Probe (Figure 600-7) extends the frequency range of the 8040A voltage measurements capability to include 100 kHz to 100 MHz input from 0.25 to 30V rms. It operates in conjunction with the 8810A dc voltage ranges, and provides a dc output that is calibrated to be equivalent to the rms value of a sinewave input.

600-38. Specifications

AC-DC Transfer: ±1 dB at 30V; ±3 dB at 2V; ±2 dB at 0.25 to 0.5V.
Frequency Response: ±1 dB from 100 kHz to 100 MHz.
Extended Frequency Response: Useful for relative readings from 20 kHz to 250 MHz.
Response: Responds to peak value of input; calibrated to read rms value of a sinewave.
Voltage Range: 0.25 to 30V rms.
Maximum DC Input: 350V dc.
Input Impedance: 12 MΩ shunted by 15 pF.

600-39. HIGH FREQUENCY PROBE (82RF)

600-40. Introduction

600-41. The Model 82RF High Frequency Probe, Figure 600-8, allows measurements over a frequency range of 100 kHz to 500 MHz from 0.25 to 30V rms. It is designed to be used with voltmeters having an input impedance higher than 10 megohms, provided the input is externally shunted to make the equivalent input impedance equal to 10 megohms.

600-42. Circuitry within the 82RF consists of a capacitor-coupled rectifier circuit which repsonds to the peak value of the input waveform. The output is positive polarity dc which is calibrated to be equivalent to the rms value of a sinewave.

600-43. Specifications

Frequency Response: ±1 dB from 100 kHz to 200 MHz; ±3 dB from 200 MHz to 500 MHz.
Extended Frequency Response: Useful for relative readings from 20 kHz to 700 MHz.
Response: Responds to peak value of input; calibrated to read rms value of a sinewave.
Voltage Range: 0.25 to 30V rms.
Maximum DC Input: 200V dc.
Input Impedance: 2 MΩ shunted by 4 pF.

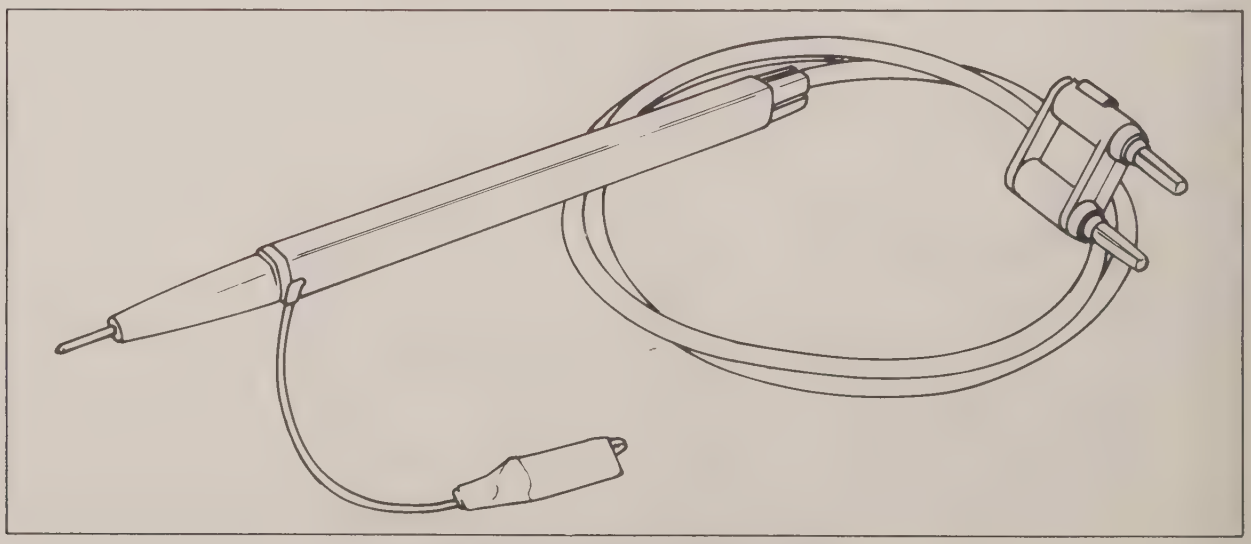


Figure 600-7. 81RF High Frequency Probe

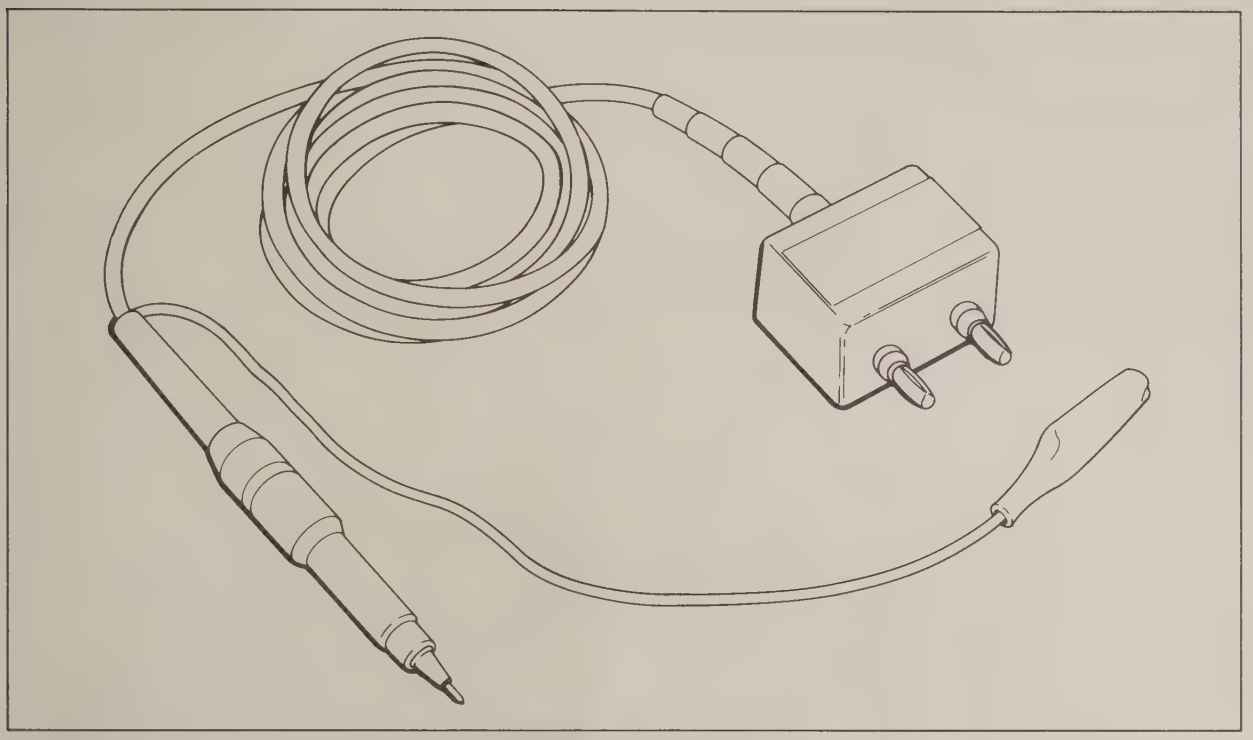


Figure 600-8. 82RF High Frequency Probe

-01 Option
8040A with Rechargeable Battery and Line Operation

601-1. INTRODUCTION

601-2. An 8040A equipped with the -01 Option comes complete with a rechargeable battery pack assembly and an A81 Battery Charger/Eliminator for operation either from line power or from the rechargeable battery. If a spare rechargeable battery pack is desired, order 8040A-7005K.

601-3. The rechargeable battery pack, item 1 in Figure 600-1, is recommended when the 8040A is to be used extensively as a portable multimeter. Four nickel cadmium (Ni-cad) batteries allow typically 8-hours of portable operation before they require recharging. The batteries may be recharged, in about 14 hours, by connecting the Charger/Eliminator accessory to the 8040A with the instrument's power switch in the OFF position.

601-4. LIST OF REPLACEABLE PARTS

601-5. All of the replaceable parts for the -01 Option are listed in Table 601-1. Figure 601-1 illustrates the table. If a spare Ni-cad battery pack is desired, order 8040A-7005K.

Table 601-1. Battery Pack Assembly

REF DES	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	BATTERY PACK ASSEMBLY (OPTION -01) FIGURE 601-1 (8040A-7005K)	430942	89536	430942			
BT1	BATTERY, NI-CAD, 1.2V (RECHARGEABLE)	423574	89536	423574	4		
H1	SCREW, FH, 4-40 X 3/8	276709	89536	276709	2		
H2	SCREW, FH, 6-32 X 1/4	114470	73734	18242	2		
MP1	COVER, BATTERY PACK	418863	89536	418863	1		
MP2	SHOCK ABSORBERS, 6-32 X 1/4	428441	89536	428441	4		
MP3	DECAL	419333	89536	419333	1		
MP4	RETAINER, BATTERY	427559	89536	427559	2		

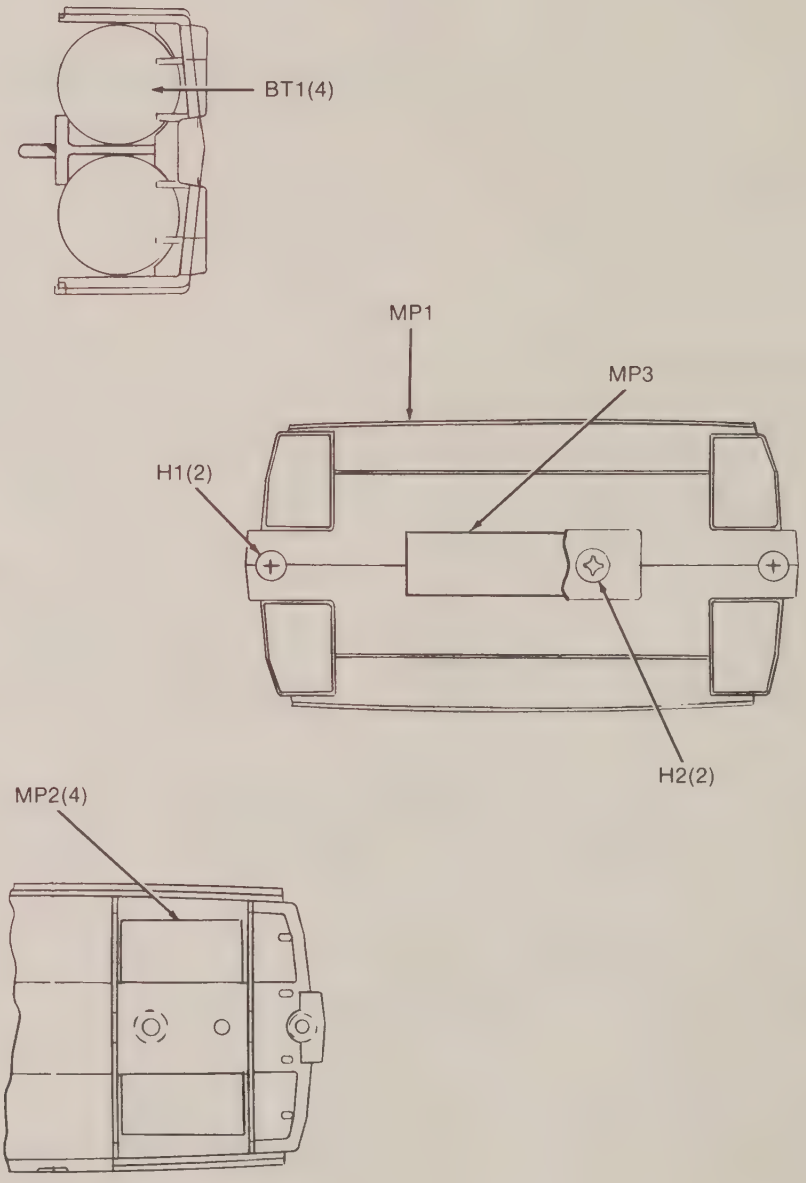


Figure 601-1. Battery Pack Assembly

-03 Option
8040A with Disposable Battery
- No Line Operation

603-1. INTRODUCTION

603-2. An 8040A equipped with the -03 Option has the disposable battery pack assembly installed. The instrument can be operated only on battery power. In all other respects, the 8040A-03 is identical to the 8040A.

Section 7
General Information

7-1. This section of the manual contains generalized user information as well as supplemental information to the List of Replaceable parts contained in Section 5. The following information is presented in this section:

List of Abbreviations
Federal Supply Codes for Manufacturers
Fluke Technical Service Centers — U.S. and Canada
Sales and Service Locations — International
Sales Representatives — U.S. and Canada

A or amp	ampere
ac	alternating current
af	audio frequency
a/d	analog-to-digital
assy	assembly
AWG	american wire gauge
B	bel
bcd	binary coded decimal
^{o}C	Celsius
cap	capacitor
ccw	counterclockwise
cer	ceramic
cermet	ceramic to metal(seal)
ckt	circuit
cm	centimeter
cmrr	common mode rejection ratio
comp	composition
cont	continue
crt	cathode-ray tube
cw	clockwise
d/a	digital-to-analog
dac	digital-to-analog converter
dB	decibel
dc	direct current
dmm	digital multimeter
dvm	digital voltmeter
elect	electrolytic
ext	external
F	farad
^{o}F	Fahrenheit
FET	Field-effect transistor
ff	flip-flop
freq	frequency
FSN	federal stock number
g	gram
G	giga (10^{9})
gd	guard
Ge	germanium
GHz	gigahertz
gmv	guaranteed minimum value
gnd	ground
H	henry
hd	heavy duty
hf	high frequency
Hz	hertz
IC	integrated circuit
if	intermediate frequency
in	inch(es)
intl	internal
I/O	input/output
k	kilo (10^{3})
kHz	kilohertz
kΩ	kilohm(s)
kV	kilovolt(s)
lf	low frequency
LED	light-emitting diode
LSB	least significant bit
LSD	least significant digit
M	mega (10^{6})
m	milli (10^{-3})
mA	milliampere(s)
max	maximum
mf	metal film
MHz	megahertz
min	minimum
mm	millimeter
ms	millisecond
MSB	most significant bit
MSD	most significant digit
MTBF	mean time between failures
MTTR	mean time to repair
mV	millivolt(s)
mv	multivibrator
MΩ	megohm(s)
n	nano (10^{-9})
na	not applicable
NC	normally closed
(–) or neg	negative
NO	normally open
ns	nanosecond
opnl ampl	operational amplifier
p	pico (10^{-12})
para	paragraph
pcb	printed circuit board
pF	picofarad
pn	part number
(+) or pos	positive
pot	potentiometer
p-p	peak-to-peak
ppm	parts per million
PROM	programmable read-only memory
psi	pound-force per square inch
RAM	random-access memory
rf	radio frequency
rms	root mean square
ROM	read-only memory
s or sec	second (time)
scope	oscilloscope
SH	shield
Si	silicon
serno	serial number
sr	shift register
Ta	tantalum
tb	terminal board
tc	temperature coefficient or temperature compensating
tcxo	temperature compensated crystal oscillator
tp	test point
u or μ	micro (10^{-6})
uhf	ultra high frequency
us or μs	microsecond(s) (10^{-6})
uut	unit under test
V	volt
v	voltage
var	variable
vco	voltage controlled oscillator
vhf	very high frequency
vlf	very low frequency
W	watt(s)
ww	wire wound
xfmr	transformer
xstr	transistor
xtal	crystal
xtlo	crystal oscillator
Ω	ohm(s)
μ	micro (10^{-6})

Fluke Technical Service Centers — U.S. and Canada

United States

CALIFORNIA
Burbank
Fluke Technical Center
2020 N. Lincoln St.
Zip: 91504
Tel. (213) 849-4641

Santa Clara
Fluke Technical Center
2300 Walsh Avenue
Zip: 95050
Tel. (408) 985-1200

COLORADO
Denver
Fluke Technical Center
1980 S. Quebec St.
Unit 4
Zip: 80231
Tel. (303) 750-1228

FLORIDA
Orlando
Fluke Technical Center
940 N. Fern Creek Ave.
Zip: 32803
Tel. (305) 896-2296

ILLINOIS
Rolling Meadows
Fluke Technical Center
1400 Hicks Road
Zip: 60008
Tel. (312) 398-5800

MARYLAND
Kensington
Fluke Technical Center
11501 Huff Court
Zip: 20795
Tel. (301) 881-6155

MASSACHUSETTS
Waltham
Fluke Technical Center
244 Second Ave.
Zip: 02154
Tel. (617) 890-1604

MINNESOTA
Minneapolis
Fluke Technical Center
10800 Lyndale Ave. So.
Zip: 55420
Tel. (612) 884-4541

NEW JERSEY
Clifton
Fluke Technical Center
460 Colfax Ave.
Zip: 07013
Tel. (201) 778-1339

NORTH CAROLINA
Greensboro
Fluke Technical Center
1310 Beaman Place
Zip: 27408
Tel. (919) 273-1918

TEXAS
Dallas
Fluke Technical Center
14400 Midway Road
Zip: 75240
Tel. (214) 233-9945

WASHINGTON
Mountlake Terrace
John Fluke Mfg. Co., Inc.
21707 66th Ave. W. Suite 1
Zip: 98043
Tel. (206) 774-2206

Canada

ALBERTA
Calgary
Allan Crawford Assoc. Ltd.
Fluke Technical Center
14-2280 39th N.E.
Zip: T2E 6P7
Tel. (403) 276-9658

ONTARIO
Mississauga
Allan Crawford Assoc. Ltd.
Fluke Technical Center
6503 Northam Drive
Zip: L4V 1J5
Tel. (416) 678-1500

QUEBEC
Longueuil
Allan Crawford Assoc. Ltd.
Fluke Technical Center
1330 Marie Victorin Blvd. E.
Zip: J4G 1A2
Tel. (514) 670-1212

Sales and Service Locations — International

Supplied and supported by Fluke (Nederland) B.V., P.O. Box 5053, Zevenheuvelenweg 53, Tilburg, Netherlands.

EUROPE

AUSTRIA
*Walter Rekirsch Elektronische
Gerate GmbH & Co. Vertrieb KG
Liechtensteinstrasse 97/6
A-1090 Vienna, Austria
Tel. (222) 347646-0

BELGIUM
*C. N. Rood S/A
37 Place de Jamblinne de Meux
B-1040 Brussels, Belgium
Tel. (02) 27352135

CYPRUS
Chris Radiovision Ltd.
P.O. Box 1989
Nicosia, Cyprus
Tel. 66121

DENMARK
*Tage Olsen A/S
Ballerup Byveg 222
DK-2750 Ballerup
Tel. (01) 2-65 81 11

FINLAND
*Oy Findip AB
Teollisuustie 7
02700 Kauniainen
Helsinki, Finland
Tel. (080) 502255

FRANCE
*M. B. Electronique S.A.
Rue Fourney
ZAC de BUC
B. P. No. 31
78530 BUC, France
Tel. (01) 9563130

GERMAN FEDERAL REPUBLIC
*Fluke (Deutschland) GmbH
4-Dusseldorf
Meineckestrasse 53
West Germany
Tel. 211-450831

*Fluke (Deutschland) GmbH
8000 Munich 80
Vertriesburo Bayern
Rosenheimer Strasse 139
West Germany
Tel. 089-404061

GREECE
*Hellenic Scientific
Representations Ltd.
11 Vrassida Street
Athens 612, Greece
Tel. (021) 7792320

ITALY
*Sistrel S.p.A.
Via Giuseppe Armellini No. 39
00143 Rome, Italy
Tel. (06) 5915551

*Sistrel S.p.A.
Via Timavo 66
20099 Sesto S. Giovanni (Milan)
Italy
Tel. (02) 2476693

NETHERLANDS
*C.N. Rood, B.V.
Cort van der Lindenstraat 11-13
Rijswijk ZH2280AA
Netherlands
Tel. (070) 996360

NORWAY
*Morgenstierne & Co. A/A
Konghellegate 3
P.O. Box 6688, Rodelokka
Oslo 5, Norway
Tel. (02) 356110

PORTUGAL
*Equipamentos
De Laboratorio Ltda.
P.O. Box 1100
Lisbon 1, Portugal
Tel. (019) 976551

SPAIN
*Hispano Electronica S.A.
Poligono Industrial Urtinsa
Apartado de Correos 48
Alcorcon (Madrid), Spain
Tel. 09-341-6194108

SWEDEN
*Teleinstrument AB
P.O. Box 490
S-162 Vallingby-4
Sweden
Tel. (08) 380370

SWITZERLAND
*Traco Electronic AG
Jenatschstrasse 1
8002 Zurich, Switzerland
Tel. (01) 2010711

TURKEY
*Erkman Electronik Aletler
Necatibey Cad 92/2
Karakoy/Istanbul
Turkey
Tel. 441546

UNITED KINGDOM
*Fluke International Corp.
Colonial Way
Watford Herts WD2 4TT, England
Tel. (0923) 40511

MIDDLE EAST

EGYPT
Lotus Engineering Organisation
P.O. Box 1252
Cairo, Egypt
Tel. 71617

IRAN
*Irantronics Company Ltd.
20 Salm Road, Roosevelt Ave.
Tehran, Iran
Tel. 828294

ISRAEL
*R.D.T. Electronics
Engineering Ltd.
46, Sokolov Street
Ramat Hasharon 47235, Israel
Tel. 482311

JORDAN
Trading & Agricultural
Development Co.
P.O. Box 567
Amman, Jordan
Tel. 23052

KUWAIT
Tareq Company
P.O. Box Safat 20506
Kuwait, Arabian Gulf
Tel. 436100

LEBANON
Mabek
P.O. Box 11-3823
Beirut, Lebanon
Tel. 252631

MOROCCO
Mainvest
Residence Moulay Ismail
Bat.C Boulevard
Moulay Slimane, Rabat, Morocco
Tel. 276-64

SAUDI ARABIA
Electronic Equipment
Marketing Est.
P.O. Box 3750
Riyadh, Saudi Arabia
Tel. 32700

SYRIA
Mabek Electronics
C/O Messers G. Ghazzi
P.O. Box 4238
Damascus, Syria

***Technical Service Available**

Customers in the following countries: Bulgaria, Czechoslovakia, Hungary, Poland, Romania, U.S.S.R. and Yugoslavia. Contact: Amtest Associates Ltd., P.O. Box 55, Addlestone, Surrey, KT 15 1DU, England, Tel. (0932) 52121

Sales and Service Locations — International (Concluded)

Supplied and supported by Fluke International Corporation, P.o. Box 43210, Mountlake Terrace, WA 98043

ARGENTINA
*Coasin S.A.
Virrey del Pino 4071
Buenos Aires, Argentina
Tel. 523185

AUSTRALIA
*Elmeasco Instruments Pty. Ltd.
P.O. Box 30
Concord, N.S.W.
Australia 2137
Tel. (02) 736-2888

Elmeasco Instruments Pty. Ltd.
P.O. Box 107
Mt. Waverly, VIC 3149
Australia
Tel. 233-4044

BANGLADESH
Kabir Brothers Ltd.
97 - Gulshan Ave., Gulshan
G.P.O. Box 693
Dacca-12, Bangladesh
Tel. 303104

BOLIVIA
Coasin Bolivia S.R.L.
Casilla 7295
La Paz, Bolivia
Tel. 40962

BRAZIL
*Arotec S.A.
Industrial e Comercio
Av. Pacaembu 811
Sao Paulo S.P., Brazil
Tel. (67) 2393

*Arotec S.A.
Av. Rio Branco, 277
Grupo 1309
Rio de Janeiro - R. J., Brazil

CHILE
*Intronica Chile Ltda.
Casilla 16228
Manuel Montt 024-Of. D
Santiago 9, Chile
Tel. 44940

COLOMBIA
Coasin Ltda.
Carrera 13, No. 37-37, Of. 407
Ap. Aereo 29583
Bogota DE, Colombia
Tel. 285-0230

ECUADOR
*Proteco Coasin CIA, Ltda.
Edifica "Jerico"
Ave. 12 de Octubre
No. 2285 y Ave. Orellana
(Planta Baja)
Quito, Ecuador
Tel. 529-684

HONG KONG
*Gilman & Co., Ltd.
P.O. Box 56
Hong Kong
Tel. 794266

ICELAND
Kristjan O. Skagfjord Ltd.
P.O. Box 906
Reykjavik, Iceland
Tel. 24120

INDIA
*Hinditron Services Pvt. Ltd.
69/A.L. Jagmohandas Marg
Bombay 400 006, India
Tel. 365344

*Hinditron Services Pvt. Ltd.
412 Raj Mahal Vilas Extn.
Bangalore 560 006, India
Tel. 33139

INDONESIA
*P.T. DWI Tunggal Jaya Sakti
Sangga Buana Bldg., 1st Floor
J1 Senen Raya 44, P.O. Box 4435
Jakarta, Indonesia
Tel. 367390

P.T. DWI Tunggal Jaya Sakti
Jalan Sasakgantung 45
Bandung, Indonesia

JAPAN
Panetron Division
Tokyo Electron Ltd.
1 Higashikata-machi
Midori-ku
Yokohama 226, Japan
Tel. (045) 471-8811

*John Fluke Mfg. Co., Inc.
1 Higashikata-machi
Midori-ku
Yokohama 226, Japan
Tel. (045) 473-5425
Tlx: 3823-666 FLUKJP J

KENYA
Adcom Limited Inc.
P.O. Box 30070
Nairobi, Kenya
East Africa
Tel. 331955

KOREA
*Electro-Science Korea Co.
C.P.O. Box 8446
Rm. 1201 Bowon Bldg.
490 Chongro-5Ka
Chongro-ku
Seoul, Korea
Tel. 261-7702

MALAYSIA
O'Connor's (Pte) Ltd.
P.O. Box 1197
Kota Kinabalu, Sabah
East Malaysia
Tel. 54082

O'Connor's (Pte) Ltd.
P.O. Box 91
Petaling Jaya, Selangor
West Malaysia
Tel. 51563

MEXICO
*C.J. Christensen S.A. de C.V.
Instrumentos Electronicos
de Medicion
Melchor Ocampo 150-8
Mexico 4, D.F., Mexico
Tel. (905) 535-2258

NEW ZEALAND
*W & K McLean Ltd.
P.O. Box 3097
Auckland, New Zealand
Tel. 587-037

NIGERIA
Mofat Engineering Co., Ltd.
P.O. Box 6369
Lagos, Nigeria

PAKISTAN
Pak International Operations
505 Muhammadi House
McLeod Road
P.O. Box 5323
Karachi, Pakistan
Tel. 221127

PERU
*Importaciones
y Representaciones
Electronicas S.A.
Avda, Franklin D. Roosevelt 105
Lima 1, Peru
Tel. 288650

SINGAPORE
*O'Connor's (Pte) Ltd.
98 Pasir Panjang Road
Singapore 5, Singapore
Tel. 637944

SOUTH AFRICA
*Fluke S.A. (Pty) Ltd.
P.O. Box 39797
Bramley 2018
Republic of South Africa
Tel. (011) 786-3170

TAIWAN
CCT Associates, Inc.
P.O. Box 24209
Taipei, Taiwan
Republic of China
Tel. (02) 391-6894

THAILAND
Dynamic Supply
Engineering R.O.P.
No. 56 Ekamai, Sukhumvit 63
Bankok 11, Thailand
Tel. 914434

URUGUAY
Coasin Uruguaya S.R.L.
Cerrito 617-4° Piso
Montevideo, Uruguay
Tel. 917978

VENEZUELA
*Coasin C.A.
APDO Postal 50939
Sabana Grande No. 1
Caracas 105, Venezuela
Tel. 782-9109

*Technical Service Available

Sales Offices — U.S. and Canada

John Fluke Mfg. Co., Inc.
P.O. Box 43210, Mountlake Terrace, WA 98043
Tel. (206) 774-2211 Toll Free: (800) 426-0361 TWX: 910-449-2850 TLX: 32-0013 Cable: Fluke

United States

AK, Anchorage
Harry Lang & Associates
1406 W. 47th Ave.
Anchorage, AK 99503
(907) 279-5741

AL, Huntsville
John Fluke Mfg. Co., Inc.
3322 S.Memorial Parkway
Huntsville, AL 35807
(205) 881-6220

AZ, Phoenix
John Fluke Mfg. Co., Inc.
7319 E. Stetson Drive
Scottsdale, AZ 85251
(602) 994-3883

CA, Burbank
John Fluke Mfg. Co., Inc.
2020 N. Lincoln Blvd.
Burbank, CA 91504
(213) 849-7181

CA, Santa Clara
John Fluke Mfg. Co., Inc.
2300 Walsh Ave.
Santa Clara, CA 95050
(408) 244-1505

CA, Tustin
John Fluke Mfg. Co., Inc.
15441 Red Hill Ave, Unit B
Tustin, CA 92680
(714) 752-6200

CO, Denver
Barnhill Three, Inc.
1980 S. Quebec St., Unit 4
Denver, CO 80231
(303) 750-1222

CT, Hartford
John Fluke Mfg. Co., Inc.
124 Hebron Ave.
Glastonbury, CT 06033
(203) 633-0777

FL, Orlando
John Fluke Mfg. Co., Inc.
940 N. Fern Creek Ave.
Orlando, FL 32803
(305) 896-4881

HI, Honolulu
EMC Corporation
2979 Ualena St.
Honolulu, HI 96819
(808) 847-1138

IL, Chicago
John Fluke Mfg. Co., Inc.
1400 Hicks Road
Rolling Meadows, IL 60008
(312) 398-0850

IN, Indianapolis
John Fluke Mfg. Co., Inc.
5610 Crawfordsville Rd.
Suite 802
Indianapolis, IN 46224
(317) 244-2456

MA, Waltham
John Fluke Mfg. Co., Inc.
244 Second Avenue
Waltham, MA 02154
(617) 890-1600

MD, Baltimore
John Fluke Mfg. Co., Inc.
11501 Huff Court
Kensington, MD 20795
(301) 881-3370
(301) 792-7060 (Baltimore)

MI, Detroit
John Fluke Mfg. Co., Inc.,
13955 Farmington Rd.
Livonia, MI 48154
(313) 522-9140

MN, Minneapolis
John Fluke Mfg. Co., Inc.
10800 Lyndale Ave. S.
Minneapolis, MN 55420
(612) 884-4336

MO, Kansas City
John Fluke Mfg. Co., Inc.
4406 Chouteau Traffic Way
Kansas City, MO 64117
(816) 454-5836

MO, St. Louis
John Fluke Mfg. Co., Inc.
300 Brooks Dr., Suite 100
Hazelwood, MO 63042
(314) 731-3388

NC,, Greensboro
John Fluke Mfg. Co., Inc
1310 Beaman Place
Greensboro, NC 27408
(919) 273-1918

NJ, Clifton
John Fluke Mfg. Co., Inc
460 Colfax Avenue
Clifton, NJ 07013
(201) 778-4040
(516) 935-6672 (Long Island)

NM, Albuquerque
Barnhill Three, Inc.
1410 D Wyoming N.E.
Albuquerque, NM 87112
(505) 299-7658

NY, Rochester
John Fluke Mfg. Co., Inc.
4515 Culver Road
Rochester, NY 14622
(716) 266-1400

OH, Cleveland
John Fluke Mfg. Co., Inc.
7830 Freeway Circle
Middleburg Heights, OH 44130
(216) 234-4540

OH, Dayton
John Fluke Mfg. Co., Inc.
4756 Fishburg Rd.
Dayton, OH 45424
(513) 233-2238

PA, Philadelphia
John Fluke Mfg. Co., Inc.
1010 West 8th Ave., Suite H
King of Prussia, PA 19406
(215) 265-4040

TX, Austin
John Fluke Mfg. Co., Inc.
111 W. Anderson Lane
Suite 213
Austin ,TX 78752
(512) 458-6279

TX, Dallas
John Fluke Mfg. Co., Inc
14400 Midway Road
Dallas, TX 75240
(214) 233-9990

TX, Houston
John Fluke Mfg. Co., Inc
1014 Wirt Road, Suite 270
Houston, TX 77055
(713) 683-7913
(512) 222-2726 (San Antonio)

UT, Salt Lake City
Barnhill Three, Inc
54 West 2100 South
Suite 3
Salt Lake City, UT 84115
(801) 484-4496

WA, Seattle
John Fluke Mfg. Co., Inc
691 Strander Blvd
Seattle, WA 98168
(206) 575-3765

Canada

ALB, Calgary
Allan Crawford Assoc., Ltd.
2280 - 39th N.E.
Calgary, ALB T2E 6P7
(403) 276-9658

BC, North Vancouver
Allan Crawford Assoc., Ltd
3795 William Street
Burnaby, BC Y5C 3H3
(604) 294-1326

NS, Halifax
Allan Crawford Assoc., Ltd
Suite 201, Townsend Pl
800 Windmill Road
Burnside Industrial Park
Dartmouth, NS B3B 1L1
(902) 469-7865

ONT, Ottawa
Allan Crawford Assoc., Ltd
1299 Richmond Road
Ottawa, ONT K2B 7Y4
(613) 829-9651

ONT, Toronto
Allan Crawford Assoc., Ltd
6503 Northam Drive
Mississauga, ONT L4V 1J5
(416) 678-1500

QUE, Montreal
Allan Crawford Assoc., Ltd
1330 Marie Victorin Blvd. E
Longueuil, QUE J4G 1A2
(514) 670-1212

For Canadian areas not listed, contact the office nearest you or Allan Crawford Assoc Ltd., Mississauga (Toronto), Ontario

For more information on Fluke products or Sales Offices you may dial (800) 426-0361 toll free in most of U.S. From Alaska, Hawaii, Washington, or Canada phone (206) 774-2481. From other countries phone (206) 774-2398.

Appendix 7A
Manual Change Information

INTRODUCTION

This appendix contains information necessary to backdate the manual to conform with earlier pcb configurations. To identify the configuration of the pcb's used in your instrument, refer to the revision letter (marked in ink) on the component side of each pcb assembly. Table 7A-1 defines the assembly revision levels documented in this manual.

NEWER INSTRUMENTS

As changes and improvements are made to the instrument, they are identified by incrementing the revision letter marked on the affected pcb assembly. These changes are documented on a supplemental change/errata sheet which, when applicable, is inserted at the front of the manual.

OLDER INSTRUMENTS

To backdate this manual to conform with earlier assembly revision levels, perform the changes indicated in Table 7A-1.

Table 7A-1. Manual Status and Backdating Information

Ref Or Option No.	Assembly Name	Fluke Part No.	* To adapt manual to earlier rev configurations perform changes in desending order (by no.), ending with change under desired rev letter																					
			—	A	B	C	D	E	F	G	H	J	K	L	M	N	P	CA						
A1	Main PCB	458570	●	●	●	●	1	8	10	11	12	13	14	X				5						
A2	Digital Conditioner PCB	427021	●	●	X																			
A3	Analog Converter PCB	426791	●	●	●	●	●	3	6	X														
A4	Volt-Ohm Input PCB	458554	●	●	●	●	7	15	16	X														
A5	Switch Interconnect PCB	427542	X																					

* X = The PCB revision levels documented in this manual.
● = These revision letters were never used in the instrument.
— = No revision letter on the PCB.

CHANGE #1-10293

In Section 5, Table 5-2, A1 Main PCB Assembly, remove the following note:

NOTE

Main PCB Assemblies stamped with Rev. -B or Rev. -C, should have the leg on Q11 soldered to the upright leg of R27. Fluke Stock No. 419283 (refer to A3Q10) should be used for Q8 in lieu of 456483 on Rev. -B or Rev. -C only, since there is no connection for the attached leg.

In Section 8, on the Analog Schematic Diagram, remove the two jumpers as shown in Figure 7A-1.

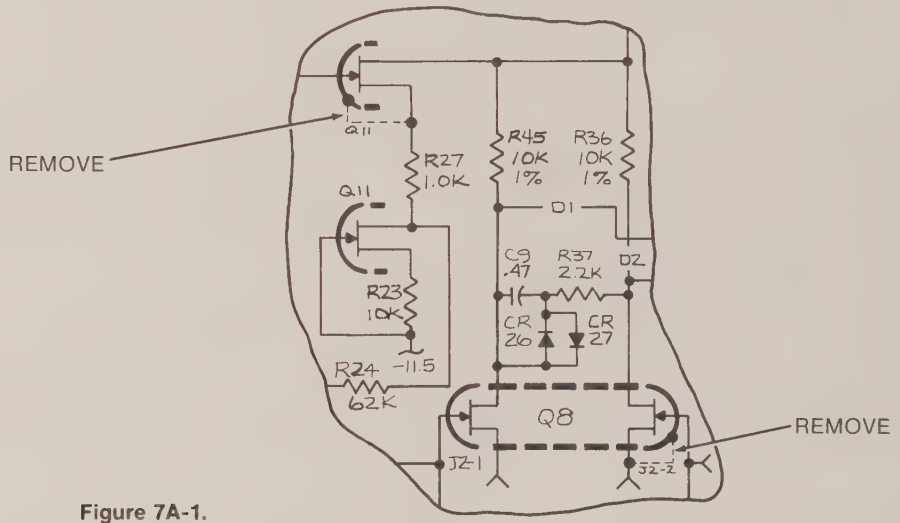


Figure 7A-1.

CHANGE #3-10534

Rev. -F, A3 Analog Converter PCB Assembly, in Section 5, Table 5-4, make the following changes:

FROM: R41, R104/Res, comp, 47k ±5%, ¼W/148163/01121/CB4735/2
TO: R41, R104/Res, carbon, 47k ±5%, ¼W/348896/80031/CR251-4-5P47K/2

FROM: R48, R57/Res, comp, 10 ±5%, ¼W/147868/01121/CB1005/2
TO: R48, R57/Res, carbon, 10 ±5%, ¼W/340075/80031/CR251-4-5P10E/2

FROM: R69, R91/Res, comp, 3.3k ±5%, ¼W/148056/01121/CB3325/2
TO: R69, R91, Res, carbon, 3.3k ±5%, ¼W/348813/80031/CR251-4-5P3K3/2

FROM: R72/Res, comp, 270k ±5%, ¼W/220061/01121/CB2745
TO: R72, Res, carbon 270k ±5%, ¼W/348961/80031/CR251-4-5P270K

FROM: R89/Res, comp, 470k ±5%, ¼W/188441/01121/CB4745/1
TO: R89, Res, carbon, 470k ±5%, ¼W/342634/80031/CR251-4-5P470K/1

FROM: R103, Res, comp, 15k ±5%, ¼W/148114/01121/CB1535/1
TO: R103/Res, carbon, 15k ±5%, ¼W/348854/80031/CR251-4-5P15K/1

Ref. Desig. R109, add flag notes 3 and 4

FROM: U13/IC, linear, Op Amp, dual/418566/12040/LM4250/1/1
TO: U13/IC, linear, Op Amp, dual/4

Alter the flag notes at the end of the table to appear as follows:

1 CR8, R32, and U34 are a matched set, order P/N 456426.

2 U11 and R109 are a selected set, order P/N 456434.

3 U38 and R109 are a selected set, order P/N 456442.

4 U13 and R109 are a selected set, order P/N 456459.

When U11, U38, or U13 is replaced, it may be necessary to reselect R109.

Indicates MOS device which may be damaged by static discharge.

CHANGE #5-10647

Rev. -CA, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: K1/Relay/459891/89536/459891/
TO: K1/Relay/423707/89536/423707/

CHANGE #6-10766

Rev. -G, in Section 5, Table 5-4, A3 Analog Converter PCB Assembly, make the following changes:

FROM: R108/Res, comp, 1.3k ±5%, ¼W/234252/01121/CB1325/1
TO: R108/Res, carbon, 13k ±5%, ¼W/441394/80031/CA251-45P13K/1

CHANGE #7-10794

Rev. -E, in Section 5, Table 5-5, A4 Volt-Ohm Input PCB Assembly, make the following changes:

FROM: J11, J12/Jack input/454058/89536/454058/2
TO: J11, J12/Jack, input/426403/89536/426403/2

CHANGE #8-10844

Rev. -F, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: XU25/Socket, IC/429282/09922/DILB40P-108/1
TO: XU25/Socket, IC/376244/01295/C934002/1

FROM: DS1/Display, LED/453340/29083/MAN3630A/1/1
TO: DS1/Display, LED/418400/50522/03203/1/1

FROM: DS2 through DS6/Display, LED/453332/29083/MAN3620A/1/1
TO: DS2 through DS6/Display, LED/418392/50522/03202/1/1

FROM: S12/Switch, slide/452862/89536/452862/1/1
TO: S12/Switch, slide/423129/10384/43-100-113/1/1

FROM: U22/IC, digital, CMOS, hex buffer/inverter/467530/89536/467530/1/1
TO: U22, IC, digital, CMOS, hex buffer/inverter/381848/02735/CD4049UBE/1/1

CHANGE #10-11519

Rev. -G, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

REMOVE: J1/Socket, 20-pin/485045/89536/485045/1
J2/Socket/16-pin/485037/89536/485037/1
J3/Socket, 12-pin/485029/89536/485029/1

CHANGE #11-11605

Rev. -H, in Section 5, on Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: C21/Cap, elect, 100 μF, –10/+50%/ 10V/170456/56289/150D107X9010R/1/1
TO: C21/Cap, elect, 100 μF, –10/+50%/ 10V/436170/73445/ET101X010A7/1/1

CHANGE #12-11849

Rev. -J, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: S12/Switch, slide/423129/89536/423129/1/1
TO: S12/Switch, slide/452862/89536/452862/1/1

CHANGE #13-11862

Rev. -K, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: DS1/Display, LED/495457/28480/QDSP3507/1
TO: DS1/Display, LED/453340/29083/MAN3630A/1

FROM: DS2 through DS6/Display, LED/495440/28480/QDSP3515/1
TO: DS2 through DS6/Display, LED/453332/29083/MAN3620A/1

CHANGE #14-12018

Rev. -L, in Section 5, Table 5-2, A1 Main PCB Assembly, make the following changes:

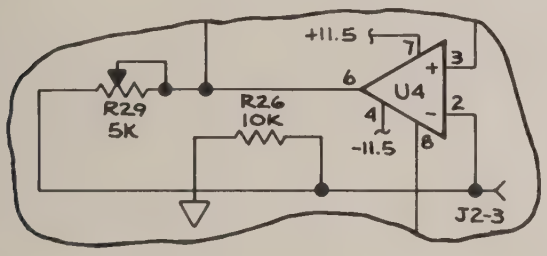
FROM: R29/Res, Var, Cermet, 5K ±10%, ½W/478883/89536/478883/1
TO: R29/Res, Comp, 1.2K ±5%, ¼W/190371/01121/CB1225/1

FROM: R26/Res, Comp, 10K ±5%, ¼W/348839/80031/CR251-4-5P10K/3
TO: R26/Res, Comp, 6.2K ±5%, ¼W/221911/01121/CB6225/1

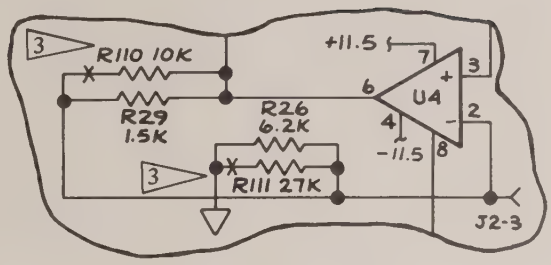
ADD: R110/Res, Carbon, 10K ±5%, ¼W/348839/80031/CR251-4-5P10KT/REF
ADD: R111/Res, Comp, 27K ±5%, ¼W/148148/01121/CB2735/1

In Section 8, on the Analog Schematic Diagram, make the following changes:

FROM:



TO:



CHANGE #15-11576

Rev. -F, Documentation change, does not affect manual.

CHANGE #16-11735

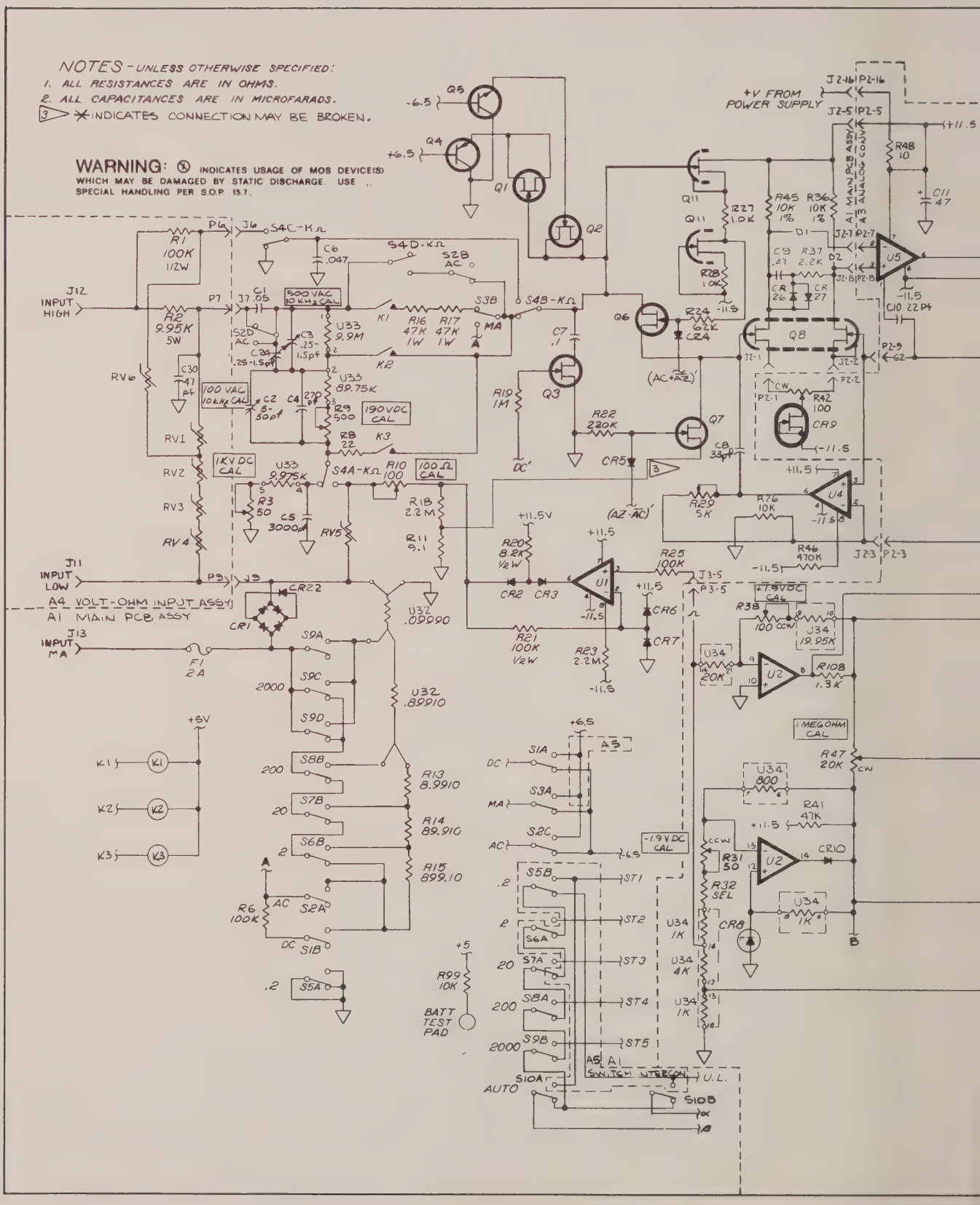
Rev. -G, in Section 5, Table 5-5, A4 Volt-Ohm Input PCB Assembly, make the following changes:

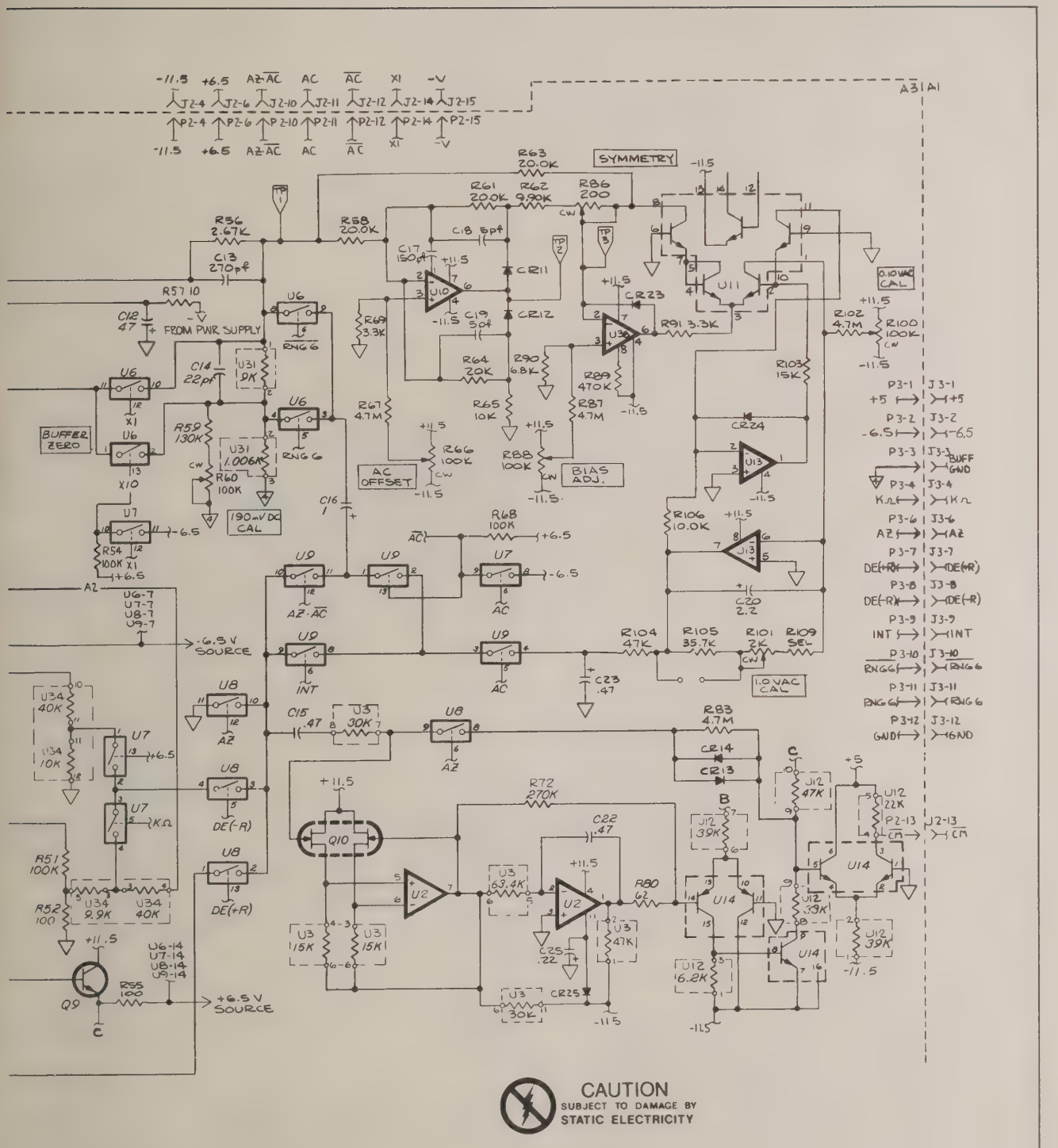
FROM: J11, J12/Jack Input/492314/89536/492314/2
TO: J11, J12/Jack Input/454058/89536/454058/2

Section 8
Schematic Diagrams

TABLE OF CONTENTS

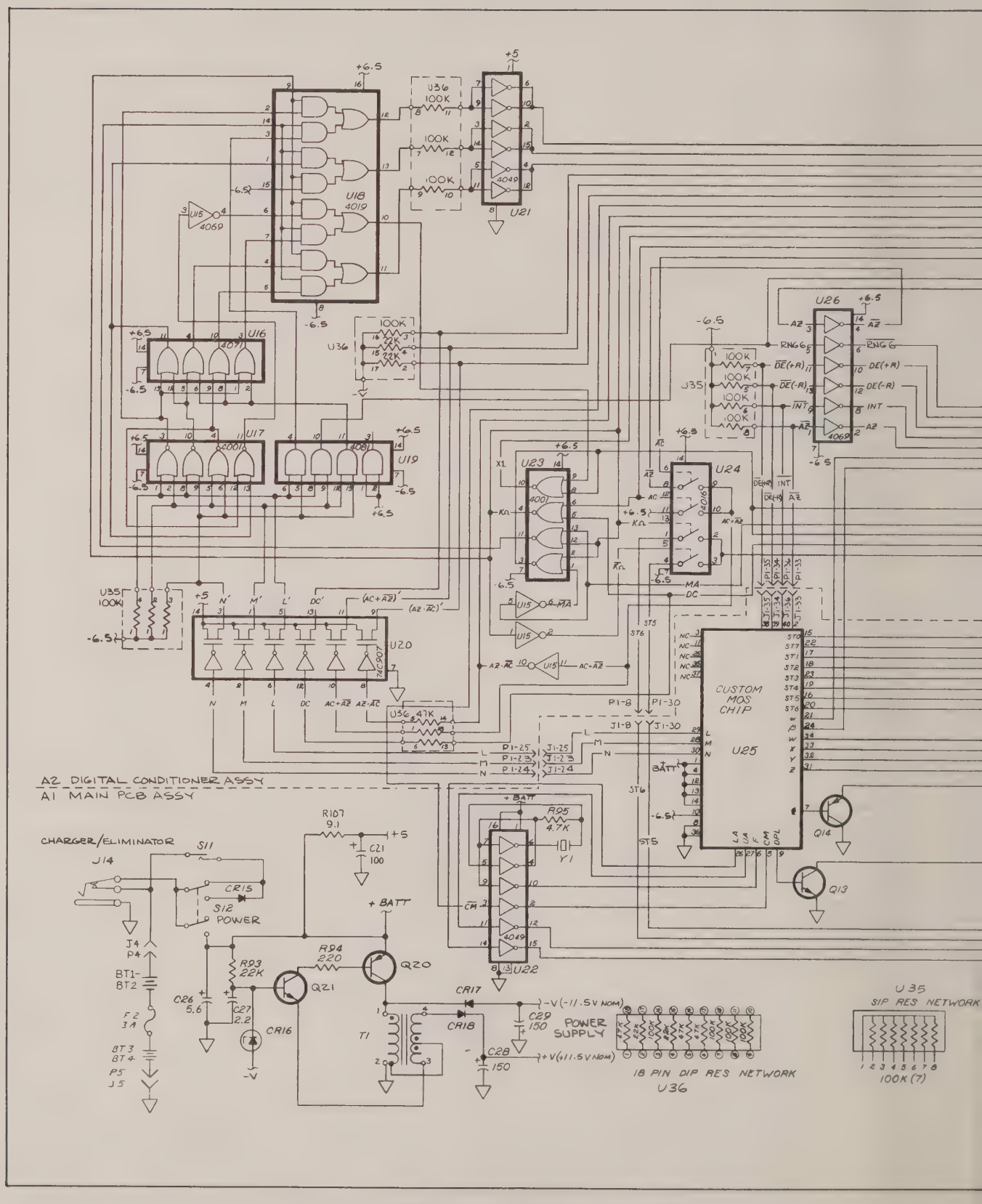
FIGURE	TITLE	PAGE
8-1	Analog Schematic Diagram	8-2
8-2	Digital Schematic Diagram	8-4


NOTES - UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCES ARE IN OHMS.
2. ALL CAPACITANCES ARE IN MICROFARADS.
3 ✕ INDICATES CONNECTION MAY BE BROKEN.
WARNING: ⊗ INDICATES USAGE OF MOS DEVICE(S) WHICH MAY BE DAMAGED BY STATIC DISCHARGE. USE SPECIAL HANDLING PER S.O.P. 15.7.
A4 VOLT-OHM INPUT ASSY
A1 MAIN PCB ASSY
A1 MAIN PCB ASSY
A3 ANALOG CONV
+V FROM POWER SUPPLY
INPUT HIGH
INPUT LOW
INPUT MA
1MEGOHM CAL
-19V DC CAL
AUTO
BATT TEST PAD
SWITCH INTERCON



8040A-1201
Sheet 1 of 2

Figure 8-1. Analog Schematic Diagram


A2 DIGITAL CONDITIONER ASSY
A1 MAIN PCB ASSY
CHARGER/ELIMINATOR
CUSTOM MOS CHIP
U25
POWER SUPPLY
18 PIN DIP RES NETWORK
U36
SIP RES NETWORK
U35
100K (7)

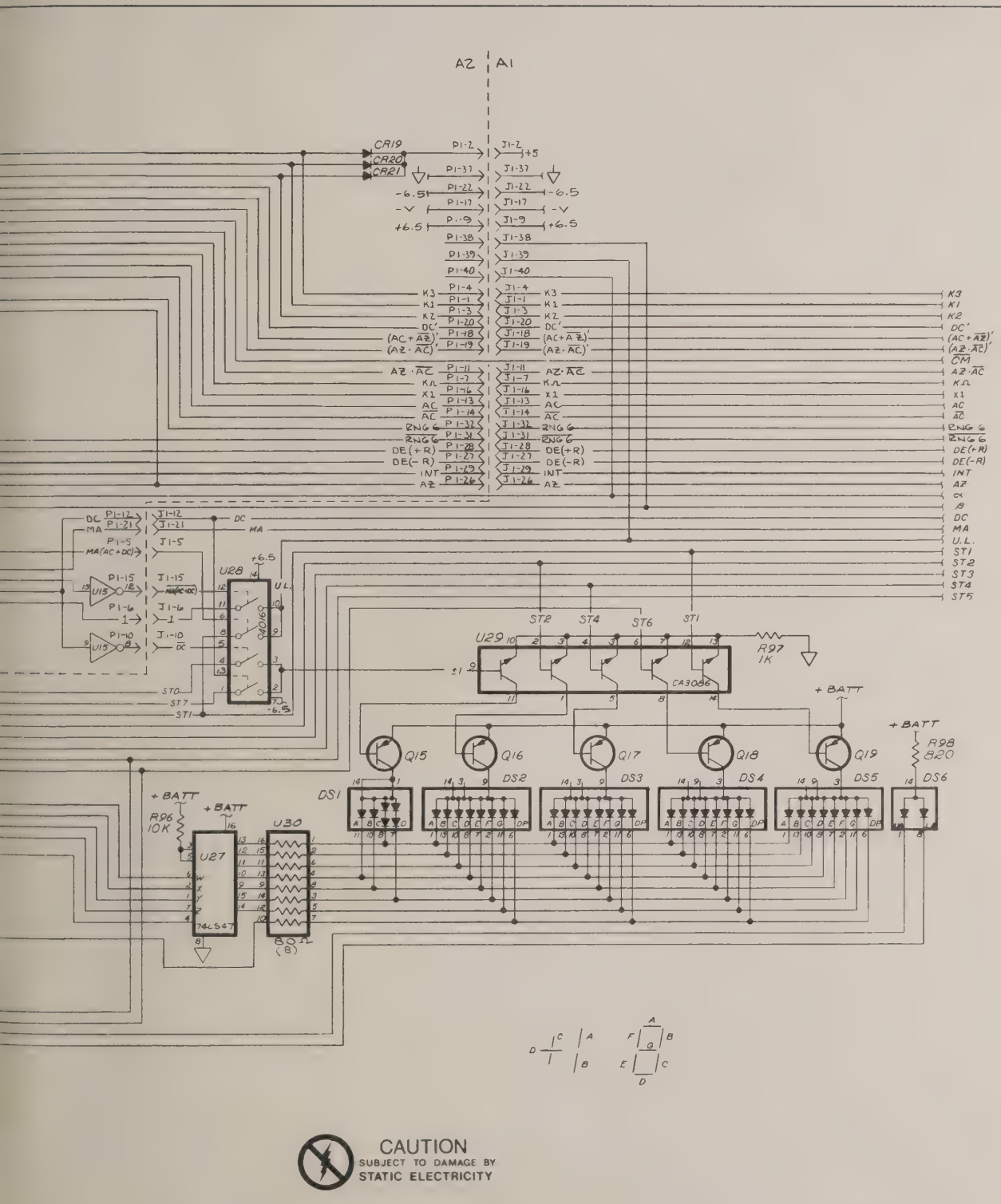


Figure 8-2. Digital Schematic Diagram